



RESEARCH ARTICLE

What is the IPCC’s assessment style and what shaped it?

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Abstract

The Intergovernmental Panel on Climate Change (IPCC) is one of the best-known global expert organizations. Its main objective is to supply policymakers with policy-relevant recent scientific information about climate change. The way in which the IPCC is obtaining this information is called an assessment. But assessments can be performed in a wide variety of ways. An important step, then, in understanding what this important organization does and why, is to figure out what characterizes the particular type of assessment it performs. The main objective of this paper is to contribute to the literature dedicated to understanding the work of IPCC by outlining the characteristics of the IPCC’s assessment style and providing an in-depth analysis of the factors that have contributed to its development. As it will be argued here, understanding the climate-scientific-specific obstacles that had to be overcome by the IPCC in the process of pursuing its objectives is crucial for understanding why the IPCC is performing the type of assessment that it does and also for understanding some of the most important controversies associated with it.

Keywords

the IPCC, IPCCs objective, criticism of IPCC, IPCCs assessment process

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1. Introduction

The Intergovernmental Panel on Climate Change (henceforth IPCC or the Panel) is a crucial organization in humanity's struggle to deal with the problem of climate change. Part of its job is to provide policymakers with the necessary information for making the best decisions in addressing this problem. In its role as a science-policy mediator, the Panel underpinned important multilateral environmental agreements on tackling climate change such as the Kyoto Protocol and the Paris Agreement. But what exactly is it that the Panel is doing, why is it doing it in that particular way and why what it does was/is perceived by some as controversial?

We can distinguish between two different strategies for tackling these questions. The first strategy is to focus on the social and political factors that played a crucial role in the setting up of the IPCC and that influenced its subsequent development. This is the most widespread approach found in the literature on the IPCC. A different strategy is to try to answer these questions by concentrating on the climate-scientific-specific obstacles that the Panel had to overcome in trying to do what it has been mandated by the UN General Assembly (UNGA) to do, and on how the solutions the Panel found for dealing with these obstacles shaped its assessment style and also generated controversies.

Both these approaches have their merits. The first one is better at accounting for the procedural¹ characteristics (i.e. those aspects that concern the structure of the organization, how the assessment² process takes place, who is involved in it and why, and how the assessment reports get evaluated) of the IPCC while the second one can be perceived as being better at explaining the substantive aspect (i.e. those aspects that concern the type of assessment performed in terms of level of research, its scope, and the detail and integration of the information presented) of the assessment performed by the Panel. Of course, the two strategies are complementary and can be used together to provide a comprehensive answer to the questions asked above about the IPCC.

This paper is meant as an exercise in the second type of strategy. As such, it should not be confused with a historical account, a social scientific explanation, or a review of the literature on some specific aspect of the IPCC. What follows is the result of an epistemological effort to identify

those climate-scientific-specific factors that were at least very important, if not crucial, in shaping the IPCC's assessment style. The first step in this effort, to which [Section 3](#) is dedicated, will be to make clear the fact that there are indeed different assessment styles, i.e., that assessments can be performed in a variety of ways. A second step ([Section 3.1.](#) and [Section 3.2.](#)) is to argue that the drive to satisfy the needs that engender it and what World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) tasked it to do were insufficient to force the Panel to adopt a particular type of assessment. [Section 4](#) will be dedicated to figuring out what exactly is IPCC's own perception of its assessment style. In [Section 5](#), the objective is to argue that a series of climate-scientific-specific obstacles that made pursuing the IPCC's objectives a very hard job was critical in shaping its assessment style. [Section 5.1.](#) will list five important aspects of climate research that can be perceived as obstacles that stood in the IPCC's path to a straightforward achievement of its objectives and will try to make the connection between the IPCC's solutions to overcoming these obstacles and the type of assessment the IPCC ended up performing. And, finally, [Section 5.2.](#) will discuss some of the controversies associated with the Panel's assessments and show that they have to do with the particular way in which the IPCC dealt with the obstacles. The starting point and the stage for the entire discussion will be set up in the next section.

2. Why did we need an IPCC to begin with? A preliminary, simple story

The IPCC was established in 1988 by the WMO and the UNEP. One story that can be told about the genesis of this organization may take the need for it as being kindled by two important developments in the 1970s and 1980s.³ The first one has to do with a series of global atmospheric/climatic issues that occurred in that period, such as the acid rain caused by the lowering of the pH of rainwater by the sulphur dioxide from the burning coal that drifted into the atmosphere, the discovery in 1985 of a hole in the ozone layer over Antarctica after years of warnings issued by scientists about the fact that man-made chemicals were harming the ozone layer, the great Sahelian drought of the 70s and 80s that led to hundreds of thousands of people dying from starvation, and the 1972 European drought that led to the Soviet crop failures in that period and the 'Great Grain Robbery' wheat deal of 1973 between the United States and the Soviet Union that caused a global food price increase by at least 30 percent. All these, together with the growing concern in that period about the effects that a potential nuclear war could have on Earth's climate (i.e. the nuclear winter scenario), made clear two things for the world's governments: that human activities can not only cause local or regional pollution-related problems but have the potential to negatively impact the entire planet by affecting the Earth's atmosphere, and that climatic

¹In making the distinction between the procedural and the substantive assessment characteristics, I'm following the discussion in [Parson et al. \(1997\)](#).

²There are at least three different ways in which one can use the word assessment. The first one is to take it as referring to an expert organization operating at the interface between science and policy (e.g. [Borie et al., 2021](#)), the second takes 'assessment' as a process aimed at providing policymakers with information relevant to the solution to those problems that are of special interest to society (e.g. [Castree et al., 2021](#); [Jabbour & Flachsland, 2017](#); [Oppenheimer et al., 2019](#)), and the last one takes it as the result of this process. In this paper, 'assessment' will be used with the second meaning, i.e. as referring to a special kind of process.

³See [Edwards \(2010\)](#) and [Bolin \(2007\)](#) for detailed accounts of the events leading up to IPCC's creation.

changes can have serious economic consequences and can lead to the loss of countless human lives. The interest to know more about the extent of this impact and to quantify the human influence on climate led to the creation of national (e.g. the United States Climate Program) and international (e.g. the World Climate Research Programme) organizations aimed at climate monitoring, climate forecasting, and basic research, and so it boosted the financing of climate research.

The result was a significant increase in climate research output all over the world. In this context, the need for establishing an IPCC was first suggested, eight years before its creation, by Aksel Wiin-Nielsen, the WMO Secretary-General between 1980 and 1983.

According to Wiin-Nielsen,

“there is a real need for some machinery to maintain regular critical scientific appraisal of... the research in a form which also renders possible definitive and authoritative statements from time to time interpreting the results in terms meaningful to those responsible for policy... These requirements could best be met by some form of international board for the assessment of all scientific aspects of the CO₂ question” (A. Wiin-Nielsen quoted in [Edwards, 2010](#), p. 377).

As it transpires from Wiin-Nielsen’s remark, in the 80s, governments and climate scientists were starting to feel the need for an organization that could do at least the following two important things: keep track of the fast-growing climate research conducted all over the world and compile a list of findings that could be communicated to the policymakers in a way that was meaningful and useful to them. So, the IPCC’s main *raison d’être* had to do with fulfilling these two tasks which are coded in the first two objectives that WMO and UNEP set up for the IPCC:

- “(i) to make assessments of available scientific information on climate change;
- (ii) to make assessments of environmental and socio-economic impacts of climate change;
- (iii) to formulate response strategies to meet the challenge of climate change” ([United Nations General Assembly, 1988](#)).

The third objective was meant to help with the policy process even more in a way that was not policy prescriptive, by providing the policymakers with clear information about the potential implications that different response strategies would end up having in terms of climatic and societal impacts.

3. Different types of assessment and possible constraints

Everything may seem clear, uncomplicated, and uncontroversial until this point: some climate-related developments in the 1970s and 1980s that were linked (in the opinion of many scientists at that time) to human activities triggered the interest

of the world’s governments to know more in order to take, if possible, the required actions to prevent economic harm and loss of human lives. This (together with a number of convoluted social and political factors)⁴ lead to the establishment of the IPCC. But what exactly is it that the IPCC is doing? This also may be perceived as an easy question. After all, only a glimpse at the literature on the IPCC may seem to provide us with more than we need for an answer: the IPCC is a global expert organization that supplies policymakers with policy-relevant recent scientific information about climate change. The way in which the IPCC is obtaining this information is called an assessment. ‘Assessment’ is usually taken in the literature to refer to the process by which expert knowledge related to those problems that are of special interest to society is generated and used to inform policy-making (e.g. [Castree et al., 2021](#); [Jabbour & Flachsland, 2017](#); [Oppenheimer et al., 2019](#)).

Of course, the above answer to the question about what it is that the Panel is doing is not mistaken. The problem with it is that it can only get us so far in understanding the IPCC. We realize this the moment we take into account the fact that there is no single way in which assessments can be performed. As discussed in [Castree, Bellamy, and Osaka \(2021\)](#), a great number of assessments have been done since the late 70s (more than 140) and although there are some things that they all have in common, the difference between them is so significant that, about the majority of them, we can only claim that they bear a family resemblance (p. 57). One reason for this is that there are many different ways in which we can deal with a problem. One can, for instance:

- Use the existing knowledge to determine whether the problem is real or not;
- Produce new knowledge relevant to the particular problem;
- Use the existing knowledge to find solutions to the problem;
- Keep track of the work done in science that is relevant to the problem;
- Identify gaps in the scientific knowledge relevant to the problem and, by doing this, establish research priorities and stimulate research that can be used to solve the problem;
- Try to quantify the uncertainty of the scientific findings that are relevant to the problem;
- Provide expert opinion on problems that involve a high degree of uncertainty or about which there is a lack of sufficient information for a proper scientific quantification.

All these different ways of dealing with a problem or a combination of them can be used to produce different types

⁴For more on these, see the discussion in [Agrawala, 1998a](#) and [Agrawala, 1998b](#).

of assessments. However, this is not the only way in which assessments can vary. Parson *et al.* (1997), for instance, claim that assessments can also “show great variation in the questions they address, the procedures by which they operate, and the substance of the outputs they deliver” (p. 53). According to Parson and his collaborators, one way to distinguish between variations across assessments is in terms of the following substantive characteristics: scope, detail, integration, novelty and level of research, and policy specificity (p. 54). Take, for instance, the novelty and level of research aspect. One way in which an assessment may proceed with respect to this aspect is by being as faithful to the existing research as possible and so by producing only a survey of the existing knowledge on the topic of interest. A completely different approach is to undertake and present new research pertaining to the problem of interest. Some assessments have been undertaken along the lines of the first approach (e.g. the 1982 report edited by William C. Clark on the CO₂ buildup in the atmosphere), some along the lines of the second (e.g. the Scientific Committee on Problems of the Environment presented new research in its 1986 report), while others preferred a combination of the two (e.g. the National Acid Precipitation Assessment Program combined new research with a survey of existing knowledge in its 1991 report).

I think enough has been said to understand, by now, why saying about the IPCC that it is a global expert organization in the business of assessing that information relevant to the issue of climate change doesn't provide us with a complete picture of what the Panel is doing. For a more substantive image, we also need to answer the following question: what type of assessment is the IPCC performing and why? This question can be tackled from at least two different directions. The first one is by looking at what the UNGA mandated the IPCC to do. A different path that one may prefer for answering our question is to think about the Panel in terms of the needs that it was meant to satisfy and the best way of satisfying those needs. The aim of the following two sections (3.1. and 3.2.) is to show that neither the mandate of the WMO and the UNEP nor the drive to satisfy the needs that engendered it could have counted as strong constraining factors for the particular assessment style that the IPCC ended up adopting.

3.1. Is the IPCC's assessment style constrained by what the WMO and UNEP tasked it to do?

One direction in which one may look to figure out what assessment style is characteristic of the IPCC and why is the resolutions by the UNGA, WMO, and the UNEP for its establishment. What one can find out by looking in that direction is this: “Following the mandate in the UN General Assembly Resolution 43/53 of 6 December 1988 (UNGA, 1988), the IPCC was designed to serve global policy with scientific information on the nature, impacts and policy implications of climate change” (Livingston *et al.*, 2018, p. 83). As it has been discussed above (Section 2), the WMO and the UNEP decided that the IPCC should pursue three main objectives. But in their resolutions, none of IPCC's parent

organizations mentioned anything about the type of assessment that the IPCC was meant to perform. This led to the following situation: the leaders of the IPCC didn't have a very clear idea in the beginning about the way the Panel had to pursue its objectives. So, they had to create their own rules and decide on the appropriate assessment style. As Bert Bolin (the founding chairman of the IPCC) recounts in his overview of the history of IPCC:

“It was clear to the leaders of the IPCC that we had to develop our own procedure for how to achieve the task that had been given us. During the first couple of years we formally followed the WMO procedures when in doubt. This lack of more precise rules of procedure for a task that was going to be rather different from the ordinary WMO activities gave the IPCC great flexibility in handling matters and could be exploited to the advantage of the assessment process, but care had to be exercised. It gradually became apparent, however, that we had to become more strict and professional in our work...” (Bolin, 2007, pp. 5–51).

By its fifth meeting (March 1991) IPCC did manage to come up with its own set of rules (Bolin, 2007, p. 70) which were subsequently amended several times over the years (IPCC, 2018).

3.2. Is the IPCC's assessment style constrained by the needs that engendered it?

The previous section showed that the way the IPCC was mandated by its parent organizations left a lot of freedom concerning the way its objectives were to be pursued and so with regard to the type of assessment that the Panel was supposed to perform. Did the need that engendered the IPCC act as a more important constraining factor on its assessment style? Not really, no. To understand why this is so, let's consider the following question: what need(s) are we referring to? We may use the discussion in Section 2 to provide the following answer: the need to keep track of those scientific findings relevant to the issue of climate change and keep the policymakers informed about important developments. But is this the whole story about the relevant needs that can be associated with the establishment of the IPCC? Of course not. This only scratches the surface. We can also speak about political needs, as is being done, for example, in Agrawala (1998a). Another type of need that is unquestionably relevant in this context is the policymaking needs, i.e. those needs that appear in the context of designing and implementing climate change-related policies. Yet another highly relevant type of need is that having to do with environmental protection. The WMO, in its decision about the setting up of the IPCC, takes as relevant the following research-related set of needs:

“BEING AWARE OF:

2. a need to

(a) maintain and develop further an efficient long-term monitoring system, making it possible to diagnose

accurately the current state of the climate system, the trends, and the factors having an influence on climate,

(b) improve our knowledge of the sources and sinks of the major radiatively important trace gases ('greenhouse gases'), and develop more reliable methods for predicting their future atmospheric concentrations,

(c) promote research aimed at closing the gaps in our ability to understand and predict the climate system, including reliable projections of the regional distribution of the expected climate change.

AGREES:

that an IPCC should be established." (quoted in [Bolin 2007](#), pp. 51–52)

What this should make clear is that, when it comes to the needs that were important in setting up the IPCC, one may tell a variety of different stories depending on the preferred perspective. This raises the following question: was it the political needs, the socio-economic needs, the environmental protection needs, the policymaking needs, or the research-related needs that played a crucial part in shaping the IPCC's assessment style? I believe that the correct answer to this question is "neither one of the above" and this is for two important reasons. First of all, a need may be satisfied in a variety of ways. Take, for instance, the research-related needs pertaining to a particular problem. Each one of the six different ways of dealing with a problem discussed above can be perceived as a good way of satisfying the need. Second of all, even if one may be able to make a strong argument for why a particular type of needs played the most significant part in IPCC's genesis that doesn't exclude the possibility of other needs being relevant as well. But different needs may pull in different directions and so they end up underdetermining the choice of a particular assessment style.

So, to wrap things up, what the discussion in this section was meant to show is that "an assessment's context cannot fully determine how it is done" ([Parson et al., 1997](#), p. 55) and this is for two important reasons: (a) it is very difficult to determine which needs were more important and why, and (b) a strong argument may be made for the underdetermination of the assessment styles by the set of needs associated with it.

4. What characterises the type of assessment that the panel is performing?

Let us remember that the main focus of this paper is on the characteristics of the type of assessment that the IPCC is performing and the main question that is addressed here is: why exactly did the IPCC adopt that particular assessment style, and why is it perceived by some as controversial? What has been done in the previous sections was to show that a satisfactory answer to this question cannot be obtained by looking at the IPCC's objectives (i.e. at what it was mandated by the WMO and UNEP to do) or at the needs that engendered it. So, if we are to understand what the IPCC is doing, i.e. the special assessment style that characterises its

activity, we have to look in a different direction for an answer to these questions. But before getting to that part of the discussion, we need to fill an important gap: saying a few words about what it is that characterises the type of assessment performed by the IPCC. This section will be dedicated to filling this gap and the preferred method for doing this will be to look at what the IPCC is saying in its last assessment report (AR6) about what it does. As, I hope, this section will make clear, an important characteristic of IPCC's assessment style is that it embodies conflicting tendencies ([Oppenheimer et al., 2019](#), p. 2005).

So, what exactly is the IPCC saying it is doing? If we browse only through IPCC's Working Group I (WGI) latest report we find a lot of different answers to this question. Here are a few examples:

1. [IPCC assesses the] "likelihood of an outcome or a result" ([IPCC, 2021](#), p. 38)
2. [IPCC provides an] "overall assessment of Earth's sensitivity to climate forcing" ([IPCC, 2021](#), p. 45)
3. "In all three Working Groups, author teams evaluate underlying scientific understanding and use two metrics to communicate the degree of certainty in key findings" ([IPCC, 2021](#), p. 169)
4. "Working Group I (WGI)... assesses the current evidence on the physical science of climate change, evaluating knowledge" ([IPCC, 2021](#), p. 150)
5. [The IPCC is concerned with providing] "a comprehensive assessment of the scientific literature" ([IPCC, 2021](#), p. 153)
6. "The assessment covers scientific literature accepted for publication by 31 January 2021" ([IPCC, 2021](#), p. 40, footnote 8)

A closer look at these quotes reveals that WGI is using at least three different meanings of 'assessment'⁵ in its report. The first meaning is evident in the first two statements. In these cases, 'assessment' is tantamount to performing the tasks of quantifying the uncertainty in key findings and of providing answers to scientific questions (such as "What is the value of ECS?"). In the next two claims (3 and 4), 'assessment' means getting involved in the epistemological enterprise of evaluating the cognitive achievements made in climate science. In the last two quotes (5 and 6), 'assessment' means the task of conducting a systematic literature survey to synthesize the research to enhance the "visibility of key knowledge developments that are potentially relevant for policymakers" ([IPCC, 2021](#), p. 154).

⁵Actually, depending on the view on probabilities adopted, the first point can be interpreted in two ways: as a scientific task and as an expert elicitation task. I will say more about "assessment" as expert elicitation below in the context of the discussion about evaluating the level of scientific understanding of tipping points.

Unfortunately, this ambiguity in what is meant by ‘assessment’ creates a lot of confusion about what it is that the IPCC is doing and about how exactly to interpret the claims that it makes in its reports. For instance, when it claims that:

(A): “The AR6 assessed best estimate [for ECS] is 3°C” (IPCC, 2021, p. 11).

what exactly is the Panel saying? We can give different answers to this question, depending on what we take ‘assessment’ to mean in this context. For instance, we can say that what we are dealing with is a scientific claim, i.e. that this estimate for ECS is the result of IPCC’s research into the problem of the value of ECS. Alternatively, we can take (A) to be the result of a thorough survey of the scientific literature. Finally, we can understand (A) as saying that climate scientists have a good grasp of this value because they satisfy the epistemological criteria for understanding, e.g. they have a good explanation for why 3°C and not some other value should be taken as the best estimate for ECS.

Taking a closer look at what the Panel is doing in the assessment reports is of no help when it comes to clarifying this issue. I will try to substantiate this next.

According to one of IPCC’s unwritten rules, the Panel does not conduct its own research (IAC, 2010; Yohe & Oppenheimer, 2011, p. 633. See also the claims regarding this made by the Panel on <https://www.ipcc.ch/>). Then, statement (A) can be taken as the result of IPCC’s survey of the scientific literature on the value of ECS. This means that we should interpret (A) as saying that this estimate (i.e. 3°C) for ECS is a key knowledge development in climate science that the IPCC uncovered through a systematic literature review.

Some of the claims made in AR6 support a different interpretation, though. In Chapter 7 it is claimed, for instance, that “New approaches to the quantification and treatment of feedbacks (Section 7.4) have *improved the understanding* of their nature and time-evolution, *leading to a better understanding* of how these feedbacks relate to equilibrium climate sensitivity” (IPCC, 2021, Ch.7.1, p. 929, my emphasis). All these references to “understanding” make it sound as if the Panel is involved in the epistemological enterprise of assessing the degree of scientific understanding of ECS and the advances in understanding made over time in climate science regarding the exact value of ECS. This interpretation gets a lot of support, also, from what is said in the description of the energy budget framework presented in Box 7.1: “The framework reflects *advances in the understanding* of the Earth system response to climate forcing since the publication of AR5” (IPCC, 2021, Ch.7.1, p. 931, my emphasis).

Getting deeper into the details of IPCC’s discussion of this topic reveals yet another possibility. Although the Panel claims it doesn’t perform research, the way it comes up with the best estimate for ECS suggests otherwise. Some of the decisions WGI made in coming up with the value of 3°C

for ECS, such as applying “weights to each model before averaging them, to produce ‘assessed global warming’ projections” (Hausfather *et al.*, 2022, p. 28)⁶ and excluding direct estimates of ECS based on earth system models (IPCC, 2021, p. 1007),⁷ go beyond the climate scientific literature on this topic. This is something that the Panel seems to acknowledge in the following statement: “this Report’s assessment is largely based on observations and an improved understanding of the climate system” (IPCC, 2021, FAQ 7.3, p. 1024). So, IPCC’s best estimate for ECS is not extracted from the literature through systematic review but is based on the report’s authors’ scientific expertise.

5. How did we get here?

Probably, the best way to summarize the discussion in the previous section is with the following quote from Oppenheimer *et al.* (2019): “In sum, the IPCC embodies conflicting tendencies and inclinations” (205). But why? How did we get here? The rest of this paper will be dedicated to showing that the reason for this has to do with the fact that, even though apparently simple, the objectives that WMO and UNEP set up for the IPCC proved to be incredibly hard to pursue. What made them so was a series of climate-scientific-specific obstacles. Trying to overcome these obstacles had a powerful impact on the Panel’s assessment style and generated some of the most important controversies associated with the Panel. As the next section will try to make clear, dealing with these obstacles forced the IPCC to shape its assessments in such a way as to include consensus-generating, uncertainty-quantification, quality-checking, hole-filling, and evidence-gathering activities.

5.1. Obstacles and assessment characteristics

The first obstacle the made the IPCC’s job a very hard one concerned the fact that a lot of climate research was being undertaken by governmental organizations and other non-academic institutions and their research output didn’t always undergo the normal scientific scrutiny (in the form of e.g. peer review) which means that they could contain

⁶Of course, since in AR6 the estimates of ECS are only informed by but not actually based on general circulation and Earth system models’ results, these results play only an indirect role in the estimates. This doesn’t mean, though, that they are not still highly important in this process. According to IPCC, “ESMs are partly used to estimate historical and paleoclimate ERFs (Sections 7.5.2 and 7.5.3); to convert from local to global mean paleo temperatures (Section 7.5.3); to estimate how feedbacks change with SST patterns (Section 7.4.4.3); and to establish emergent constraints on ECS (Section 7.5.4). They are also used as important evidence in the process of understanding estimates of the temperature, water vapour, albedo, biogeophysical, and non-CO2 biogeochemical feedbacks, whereas other evidence is primarily used for cloud feedbacks where the climate model evidence is weak (Section 7.4.2)” (Ch. 7, p. 1008).

⁷IPCC is claiming (Ch. 7.5.6, p. 1007) that in doing this it follows some recent studies (i.e. the multiple lines of evidence approach found in Stevens *et al.*, 2016; and Sherwood *et al.*, 2020), but, as made clear in Baulenas *et al.* (2023, p. 10) this approach is far from being the norm in the literature.

hidden errors. A well-known example is the one that captured the attention of the media in early 2010: the case of the melting of the Himalayan glaciers. A report published in 1999 by the Working Group on Himalayan Glaciology (WGHG) of the International Commission for Snow and Ice (ICSI), a body of the World Wildlife Fund (WWF), an environmental organization, stated that Himalayan glaciers could disappear by 2035. But, as many scientists around the world made clear (and as the authors of the report acknowledged (WWF, 2005, p. i)), this is highly unlikely to happen even if the thinning rate of the glaciers increases dramatically compared to recent trends (Kargel *et al.*, 2011). What episodes similar to this one made clear was that the IPCC could not just uncritically incorporate in its reports all the climate-scientific research results but had to verify them beforehand, i.e. it had to perform a quality check of the literature.

A second obstacle had to do with the lack of consensus in the climate scientific literature on key findings. Take for instance the case of the equilibrium climate sensitivity (ECS). ECS is a metric used to quantify how much warming is generated (by the time the climate has reached a new equilibrium) by a doubling of the CO₂ in the atmosphere relative to the pre-industrial climate. ECS is probably the most important metric for IPCC because it is crucial for determining how serious the anthropogenic impact on climate is. Unfortunately, the climate-scientific community is highly divided when it comes to the value of ECS. For example, in its fifth assessment report (AR5), IPCC estimates that ECS is *likely* in the 1.5 – 4.5 range, but climate models-based estimates and estimates that rely on paleoclimate records appeared (at the time of AR5) to rule out ECS values in the lower range (i.e., ECS smaller than 2). For IPCC to come up with the 1.5 – 4.5 range, it had to create or force consensus on this issue by convincing the climate scientists engaged in modelling about the relevance of several studies that derived ECS from the instrumental records of historical temperatures and that calculated a lower range for ECS. This obstacle influenced the IPCC's particular assessment style by forcing the Panel to act as a consensus-generating machinery (of course, as we will see below, this characteristic of the IPCC's assessment style led to controversy because the consensus that it generates has been perceived as artificial, detrimental to scientific practice, and not at all representative of the diversity of views found in the literature).

Yet another problem that affected the type of assessment the IPCC is performing had to do with uncertainty. Even if there would be widespread agreement in the scientific community on a specific range for the ECS, for instance, this range would still not constitute a *definitive statement* (see the quote from Wiin-Nielsen in Section 2) about ECS because there is still a lot we don't know about Earth's climate system and so all the climate-scientific results are (to a certain degree) uncertain. This, of course, is less than optimal if the aim is to provide assessments that are meant to be policy-relevant. One way to deal with this problem is to try to quantify the uncertainties. But what is the best way to characterize

and quantify the climate-scientific uncertainties? This is a question that the Panel had to address. Since its inception, the management and reporting of uncertainties have been a big topic on IPCC's agenda (Mastrandrea & Mach, 2011). Unfortunately, the first assessment reports didn't use a consistent framework for communicating uncertainties across the three Working Groups. Such a framework was created by the IPCC starting with its third AR and has constantly been improved since then (Mach *et al.*, 2017; Mastrandrea *et al.*, 2010; Mastrandrea *et al.*, 2011; Moss & Schneider, 2000).

A fourth obstacle that influenced the IPCC's assessment style has to do with the fact that there is no single scientific discipline responsible for generating knowledge relevant to what Wiin-Nielsen called "the CO₂ question." There are, in fact, dozens of scientific disciplines (e.g., Climatology, Oceanography, Glaciology, Paleoclimatology, Ecology, Human geography, Economics, etc.) that together generate this type of knowledge. This situation forced the Panel to act as an interdisciplinary knowledge integration system. That it indeed assumed this function is clear from the following statement from the preface to its latest AR: "The report recognizes the interactions of climate, ecosystems and biodiversity, and human societies, and integrates knowledge more strongly across the natural, ecological, social and economic sciences than earlier IPCC assessments" (IPCC, 2021, WG2, p. ix).

Of course, the problem with the knowledge relevant to the CO₂ question is not only that it is scattered across different disciplines, it is also that there are gaps in it. This constituted a fifth important factor that constrained IPCC's assessment style: it couldn't just provide a synthesis of knowledge but had, in some cases, to step in and fill important knowledge gaps (Tol, 2011, Yohe & Oppenheimer, 2011). For example, in AR4, the IPCC took it upon itself to provide an estimate of the contribution that the large ice sheets (Greenland and Antarctica) may have to future sea level rise (Oppenheimer *et al.*, 2007). A second, and arguably more important, knowledge gap that the IPCC tried to fill concerns the future anthropogenic greenhouse gas emission scenarios (Yohe & Oppenheimer, 2011). As noted by Bolin, at the time of the first IPCC report, "the construction of emissions scenarios for greenhouse gases had not yet attracted much attention from the scientific community" (Bolin, 2007, p. 65). IPCC's Working Group III took upon itself the task of developing a set of four such scenarios. Given the fact that the most important source of uncertainty affecting global climate projections is represented by our lack of knowledge about future anthropogenic emissions, this is quite an important contribution. Another important knowledge gap that the IPCC tackled by generating its genuine scientific output concerns the topic of abrupt changes and tipping points. One way in which the Panel addressed this problem was via expert judgements, but, as argued by Lam and Majszak (2022), "expert judgment about climate and Earth system tipping points is actually often used as a genuine scientific output, complementary to – but not independent of – model outputs" (p. 9).

5.2. Obstacles and controversies

The previous section was dedicated to showing that the type of assessment performed by the IPCC was strongly influenced by a series of climate-scientific-specific obstacles. As a result of trying to overcome these obstacles, the Panel ended up being involved in several activities (such as quality-checking, uncertainty-quantification, holes-filling, and evidence-gathering) that determined its particular assessment style. This section aims to show that dealing with these obstacles is also the source of some of the most important controversies associated with IPCC's activities.

In trying to overcome the first obstacle (i.e. the hidden errors in the research), the IPCC had to act as an epistemic authority in charge of providing quality control for all the research output relevant to the question of climate change. However, there are several problems associated with IPCC assuming such a position. One of these has to do with satisfying the criteria for it: does the IPCC have what it takes to be considered an epistemic authority on climate change? This is not an easy question to answer because it is not clear what is needed to claim such authority in the first place. What I believe is uncontroversial is that putting together (to achieve the objectives laid out by WMO and UNEP) a bunch of scientists nominated by the governments of member countries, and whose activities and reports are politically supervised, clearly isn't enough for it. But it is not at all obvious that the IPCC does more than that.

Also, even though it managed to mobilize a lot of scientists from all over the world, the Panel still lacks the resources to eliminate all the errors hidden in the literature and so some mistakes can still sneak, through its assessment process, into its reports. This is exactly what happened in IPCC's AR4 with the case of the melting of the Himalayan glaciers. As we saw above, a report by WGHG stated mistakenly that Himalayan glaciers could disappear by 2035. As a scientific authority on all things pertaining to climate change, the IPCC should have spotted this mistake. But it didn't. So IPCC's Working Group II (WGII) ended up including it in its report (Anderegg *et al.*, 2014, p. 1448). According to Kargel *et al.* (2011),

“this error... shredded the reputation of a large and usually rigorous international virtual institution. The gaffe by the Intergovernmental Panel on Climate Change helped to trigger a global political retreat from climate change negotiations, and it may prove to have been one of the more consequential scientific missteps in human history” (p. 14709).

This last statement is clearly an exaggeration of the impact that this episode had⁸ on the scientific credibility of the IPCC

⁸A survey of several polls performed by Anderegg *et al.* (2014, p. 1448) suggests that the incident didn't have a significant impact on Americans' trust in climate scientists, for instance.

and on the international community's attitude towards the issues of fighting climate change since the IPCC continues to command substantial trust in the present day and tackling climate change remains very much a global policy priority. But it does bring to the forefront another problem associated with assuming the status of an epistemic authority. Having this status means that the IPCC is in the position of “speaking with one voice for global climate science” (Hoppe & Rödder 2019). But this position doesn't leave room for mistakes because any mistake affects the credibility of the entire climate-scientific community and it has the potential to negatively impact the policy-making process.

A good thing about IPCC's epistemic authority status is that, by occupying this position, it has the power to force scientific consensus⁹ on key climate scientific results.¹⁰ According to Boers, Ghil & Stocker (2022):

“The preparation of an IPCC assessment report is essentially a consensus-building process. It forces the scientific community to assess the current state of knowledge on a specific issue, formulate a consensus where possible, map out the uncertainties...” (p. 17).

This is good because it addresses the second problem discussed in Section 5.1. (i.e. the lack of consensus on key findings), but, most importantly, because, according to some authors,¹¹ it plays a crucial role in convincing the policymakers (and the general public) that human-caused climate change is real and so it is essential for generating greater support for public action. Unfortunately, it is also an important source of controversies.

According to Yohe & Oppenheimer (2011), “the emphasis on consensus is the most troublesome limitation of IPCC assessment

⁹Actually, this is not only something that the IPCC can do. It is something that it has to do. Consensus is the first procedural requirement encoded in *The Principles Governing IPCC Work*: in all its activities, IPCC “shall use all best endeavours to reach consensus” (IPCC, 2018). This strive for consensus was not something that was pursued by the IPCC from the beginning, though. As it is made clear by Bolin (2007): “agreements were not always easy to reach. I had repeatedly pointed out to the working groups that the goal was not necessarily always to reach an agreement, but rather to point out different views when necessary and to clarify the reasons for disagreements when possible, but this was still seldom tried” (p. 61–2).

¹⁰See De Pryck (2021) for a recent account of what consensus amounts to in this context and the elaborate process through which it is reached by the IPCC.

¹¹According to the gateway belief model of public responses to climate change, there is a positive correlation between the perceived level of consensus in scientific opinion and the degree of acceptance of the climate scientific results by the general public, and so, the consensus is crucial in eliciting public support for climate-related policies (Lewandowsky *et al.*, 2013; Van der Linden *et al.*, 2015; Van der Linden *et al.*, 2019). This model is recently challenged in Ma *et al.* (2019) and Dixon, Hmielowski & Ma (2023) where it is argued that in some cases (e.g. among conservatives or those with dismissive prior views) scientific consensus messages, instead of inducing support for action, may end up activating a cognitive mechanism known as psychological reactance.

processes” (p. 634). This limitation has repercussions both on policymaking and on the climate-scientific practice. One way in which the emphasis on consensus may end up hurting policymaking is by ignoring or downplaying extreme possibilities (Oppenheimer *et al.*, 2007). By being the product of a consensus approach, the IPCC reports inadvertently end up hiding important information from the policy-makers and so manage to shield them from understanding more extreme possibilities which, potentially, could be important for taking more nuanced climate change mitigation actions. Other authors identify other important problems with IPCC’s emphasis on consensus. For instance, IPCC’s approach is taken by Curry (2011) to end up masking the complexities of the climate change problem and the associated uncertainties in our understanding, and by Van der Sluijs *et al.* (2010) to underexpose matters over which there is no consensus. According to Hulme (2022), it also encourages premature agreement among experts where there is none and may come across as unfair and unaccommodating to the full range of accredited views.

Besides standing in the way of good policymaking, the consensus approach can have additional negative effects by interfering with the normal climate scientific practice. One significant concern is that in emphasizing consensus, the underlying scientific foundations of individual studies can be overlooked and so this approach may lead to a loss of appreciation for the merits and nuances of each study, and, more importantly, to a failure to identify avenues for making further progress (Stevens *et al.*, 2016, p. 514).

The next obstacle that was approached by the IPCC in a way that generated controversies concerns the treatment of uncertainty. Given the characteristics of the climate system, the evolving nature of its research, the difficulties in anticipating what we as a society will do in the future, etc., the information about climate change has inherently uncertain components and so cannot be expressed as statements of facts. What this means is that, in its reports, to properly inform policymaking, the Panel has to provide a clear and coherent characterization of uncertainties and the confidence levels associated with the key findings. So, as stated by Oppenheimer *et al.* (2016), “Managing the risks of climate change requires a consistent and comprehensive approach to quantifying uncertainty and a clear narrative to describe the process” (p. 445). Has the IPCC managed to do that? No, it did not. I am not going to enter into details here about the IPCC’s failures in this regard. There is a lot of literature on this topic and surveying it would require a lot of space.¹² What I should say, though, is that IPCC’s failure to create a good framework for the treatment of uncertainties is very unfortunate given

the fact that the issue of uncertainty is a notorious weakness of the reports which has been effectively used by the climate change sceptics to argue against the necessity of taking any kind of climate actions.

The last two obstacles, i.e., putting together different lines of evidence and filling holes in research, got the IPCC involved in conducting new research. This means that it had to violate one of the most important unwritten rules regulating its activity: “IPCC shall perform no original research” (Yohe & Oppenheimer, 2011, p. 633). This explains, at least partly, what is referred to above as the conflicting tendency that characterises IPCC’s assessment. The fact that the Panel decided to get involved in research was perceived by some as particularly troublesome. A strong case for why this is concerning is made, for instance, in Tol (2011). According to Tol, the Panel exerts a monopoly not only on climate policy advice but also on climate-scientific research. But, as it is well known, monopolies are usually associated with negative outcomes such as reduced competition, less innovation, and inferior products or services. According to Tol, all these downsides can also be associated with IPCC’s research: its outputs (such as emission scenarios) are more widely used than any of the alternatives, the Panel has not innovated much, and the quality of the assessment reports has declined over time.

6. Conclusion

The main objective of this paper was to explore a different strategy for accounting for an important aspect of IPCC’s activity: the type of assessment that it performs in order to obtain policy-relevant scientific information about climate change. Instead of focusing on the social and political factors that influenced its genesis, the discussion in this paper revolves around the climate-scientific-specific obstacles that the IPCC had to overcome in order to achieve its objectives. These obstacles include the need to address consensus-issues, the inherent uncertainty of climate-scientific results, the interdisciplinary nature of climate research, and the gaps in knowledge relevant to climate change. It is the contention of this paper that the Panel’s response to these obstacles acted as both the main constraining factor on its assessment style and the principal source of controversies associated with it.

Ethics and consent

Ethical approval and consent were not required.

Data availability

Underlying data

This paper does not involve the collection of empirical data, and so there are no specific datasets or materials associated with the study. All information and arguments presented in the paper are based on existing literature and the author’s analysis.

No data are associated with this article.

¹²For an in-depth overview of these problems, see, for instance, the discussion in Adler and Hadorn (2014), Aven and Renn (2015), Mach *et al.* (2017), Janzwood (2020), and Kause *et al.* (2022).

References

- Adler CE, Hirsch Hadorn G: **The IPCC and treatment of uncertainties: topics and sources of dissensus.** *WIREs Clim Change.* 2014; **5**(5): 663–676.
[Publisher Full Text](#)
- Agrawala S: **Context and early origins of the Intergovernmental Panel on Climate Change.** *Clim Change.* 1998a; **39**(4): 605–620.
[Publisher Full Text](#)
- Agrawala S: **Structural and process history of the Intergovernmental Panel on Climate Change.** *Clim Change.* 1998b; **39**(4): 621–642.
[Publisher Full Text](#)
- Anderegg WR, Callaway ES, Boykoff MT, et al.: **Awareness of both type 1 and 2 errors in climate science and assessment.** *Bull Am Meteorol Soc.* 2014; **95**(9): 1445–1451.
[Publisher Full Text](#)
- Aven T, Renn O: **An evaluation of the treatment of risk and uncertainties in the IPCC reports on climate change.** *Risk Anal.* 2015; **35**(4): 701–712.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Baulenas E, Versteeg G, Terrado M, et al.: **Assembling the climate story: use of storyline approaches in climate-related science.** *Glob Chall.* 2023; **7**(7): 2200183.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Boers N, Ghil M, Stocker TF: **Theoretical and paleoclimatic evidence for abrupt transitions in the Earth system.** *Environ Res Lett.* 2022; **17**(9): 093006.
[Publisher Full Text](#)
- Bolin B: **A history of the science and politics of climate change: the role of the Intergovernmental Panel on Climate Change.** Cambridge Univ Press, 2007.
[Publisher Full Text](#)
- Borie M, Mahony M, Obermeister N, et al.: **Knowing like a global expert organization: comparative insights from the IPCC and IPBES.** *Global Environ Chang.* 2021; **68**: 102261.
[Publisher Full Text](#)
- Castree N, Bellamy R, Osaka S: **The future of global environmental assessments: making a case for fundamental change.** *Anthropocene Rev.* 2021; **8**(1): 56–82.
[Publisher Full Text](#)
- Curry J: **Reasoning about climate uncertainty.** *Clim Change.* 2011; **108**(4): 723–732.
[Publisher Full Text](#)
- De Pryck K: **Intergovernmental expert consensus in the making: the case of the summary for policymakers of the IPCC 2014 synthesis report.** *Global Environ Politics.* 2021; **21**(1): 108–129.
[Publisher Full Text](#)
- De Pryck K, Hulme M, (Eds.): **A critical assessment of the Intergovernmental Panel on Climate Change.** Cambridge Univ Press, 2022.
[Publisher Full Text](#)
- Dixon G, Hmielowski J, Ma Y: **More evidence of psychological reactance to consensus messaging: A response to van der Linden, Maibach, and Leiserowitz (2019).** *Environ Commun.* 2023; **17**(1): 9–15.
[Publisher Full Text](#)
- Edwards PN: **A vast machine: computer models, climate data, and the politics of global warming.** MIT Press, 2010.
[Reference Source](#)
- Hausfather Z, Marvel K, Schmidt GA, et al.: **Climate simulations: recognize the 'hot model' problem.** *Nature.* 2022; **605**(7908): 26–29.
[PubMed Abstract](#) | [Publisher Full Text](#)
- Hoppe I, Rödder S: **Speaking with one voice for climate science—Climate researchers' opinion on the consensus policy of the IPCC.** *J Sci Commun.* 2019; **18**(3): A04.
[Publisher Full Text](#)
- Hulme M: **Scientific consensus-seeking.** In: De Pryck K, Hulme M (eds.) *A Critical Assessment of the Intergovernmental Panel on Climate Change.* Cambridge Univ Press, 2022; 178–186.
[Publisher Full Text](#)
- IAC: **Climate change assessments: review of the processes and procedures of the IPCC.** 2010.
[Reference Source](#)
- IPCC: **Principles governing IPCC Work.** 2018; [Accessed 11.11.2023].
[Reference Source](#)
- IPCC: **Climate change 2021: the physical science basis.** Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge Univ Press, 2021.
[Reference Source](#)
- Jabbour J, Flachsland C: **40 years of global environmental assessments: a retrospective analysis.** *Environ Sci Policy.* 2017; **77**: 193–202.
[Publisher Full Text](#)
- Janzwood S: **Confident, likely, or both? the implementation of the uncertainty language framework in IPCC special reports.** *Clim Change.* 2020; **162**(3): 1655–1675.
[Publisher Full Text](#)
- Kargel JS, Cogley JG, Leonard GJ, et al.: **Himalayan glaciers: the big picture is a montage.** *Proc Natl Acad Sci U S A.* 2011; **108**(36): 14709–14710.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Kause A, Bruine de Bruin W, Persson J, et al.: **Confidence levels and likelihood terms in IPCC reports: a survey of experts from different scientific disciplines.** *Clim Change.* 2022; **173**(1–2): 2.
[Publisher Full Text](#)
- Lam V, Majszak MM: **Climate tipping points and expert judgment.** *WIREs Clim Change.* 2022; **13**(6): e805.
[Publisher Full Text](#)
- Lewandowsky S, Gignac GE, Vaughan S: **The pivotal role of perceived scientific consensus in acceptance of science.** *Nat Clim Change.* 2013; **3**(4): 399–404.
[Publisher Full Text](#)
- Livingston JE, Lövbrand E, Olsson JA: **From climates multiple to climate singular: maintaining policy-relevance in the IPCC synthesis report.** *Environ Sci Policy.* 2018; **90**: 83–90.
[Publisher Full Text](#)
- Ma Y, Dixon G, Hmielowski JD: **Psychological reactance from reading basic facts on climate change: the role of prior views and political identification.** *Environ Commun.* 2019; **13**(1): 71–86.
[Publisher Full Text](#)
- Mach KJ, Mastrandrea MD, Freeman PT, et al.: **Unleashing expert judgment in assessment.** *Glob Environ Chang.* 2017; **44**: 1–14.
[Publisher Full Text](#)
- Mastrandrea MD, Field CB, Stocker TF, et al.: **Guidance note for lead authors of the IPCC fifth assessment report on consistent treatment of uncertainties.** 2010.
[Reference Source](#)
- Mastrandrea MD, Mach KJ: **Treatment of uncertainties in IPCC assessment reports: past approaches and considerations for the fifth assessment report.** *Clim Change.* 2011; **108**: 659.
[Publisher Full Text](#)
- Mastrandrea MD, Mach KJ, Plattner GK, et al.: **The IPCC AR5 guidance note on consistent treatment of uncertainties: a common approach across the working groups.** *Clim Change.* 2011; **108**: 675.
[Publisher Full Text](#)
- Moss RH, Schneider SH: **Towards consistent assessment and reporting of uncertainties in the IPCC TAR: Initial recommendations for discussion by authors.** New Delhi: TERI, 2000.
- Oppenheimer M, Little CM, Cooke RM: **Expert judgment and uncertainty quantification for climate change.** *Nat Clim Change.* 2016; **6**(5): 445–451.
[Publisher Full Text](#)
- Oppenheimer M, O'Neill BC, Webster M, et al.: **The limits of consensus.** *Science.* 2007; **317**(5844): 1505–1506.
[Publisher Full Text](#)
- Oppenheimer M, Oreskes N, Jamieson D, et al.: **Discerning experts: the practices of scientific assessment for environmental policy.** University of Chicago Press, 2019.
[Publisher Full Text](#)
- Parson E, Agrawala S, Patt A, et al.: **Explaining the form of assessments: why do we get the assessments we do?** Global Environmental Assessment Project, 1997, A Critical Evaluation of Global Environmental Assessments: The Climate Experience. Calverton, MD: CARE., 1997; 49–78.
- Sherwood SC, Webb MJ, Annan JD, et al.: **An assessment of Earth's climate sensitivity using multiple lines of evidence.** *Rev Geophys.* 2020; **58**(4): e2019RG000678.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Stevens B, Sherwood SC, Bony S, et al.: **Prospects for narrowing bounds on Earth's Equilibrium Climate Sensitivity.** *Earths Future.* 2016; **4**(11): 512–522.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
- Tol RSJ: **Regulating knowledge monopolies: the case of the IPCC.** *Clim Change.* 2011; **108**(4): 827.
[Publisher Full Text](#)
- United Nations General Assembly: **Protection of global climate for present and future generations of mankind: resolution / adopted by the general assembly.** 1988.
[Reference Source](#)

van der Linden S, Leiserowitz A, Maibach E: **The gateway belief model: a large-scale replication.** *J Environ Psychol.* 2019; **62**: 49–58.
[Publisher Full Text](#)

van der Linden SL, Leiserowitz AA, Feinberg GD, *et al.*: **The scientific consensus on climate change as a gateway belief: experimental evidence.** *PLoS One.* 2015; **10**(2): e0118489.

[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)

van der Sluijs JP, van Est R, Riphagen M: **Beyond consensus: reflections from a democratic perspective on the interaction between climate politics and**

science. *Curr Opin Environ Sustain.* 2010; **2**(5–6): 409–415.

[Publisher Full Text](#)

WWF: **An overview of glaciers, glacier retreat, and subsequent impacts in Nepal, India, and China.** 2005.

[Reference Source](#)

Yohe G, Oppenheimer M: **Evaluation, characterization, and communication of uncertainty by the Intergovernmental Panel on Climate Change—an introductory essay.** *Clim Change.* 2011; **108**: 629.

[Publisher Full Text](#)

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Emma Gusheva 

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The article is a philosophical investigation of IPCC assessments on climate change. It aims to describe the assessment in light of its goals/process and argument possible reasons why it is structured in that specific way. The scientific merit of this work could be in highlighting logical fallacies in the IPCC's aims and tasks, but a lot of improvement is needed.

First, the article would be improved by using more specific language instead of general terms and including more references for your claims. For example, you state that the way the IPCC goes about reaching its objective of supplying policymakers with policy-relevant scientific information is called an assessment. But what exactly is an assessment? Are all the tasks IPCC does part of the assessment? Are the IPCC communication efforts or the SPM approval process part of the assessment? It would be beneficial if you describe the IPCC assessment process, especially for readers less familiar with the IPCC. Moreover, given that your aim is to describe the IPCC assessment style, I recommend that you compare it in a more systematic way with comparable assessments. This can also be tied to your description of the IPCC assessment process. You discuss 'climate-scientific-specific obstacles'? But how are you sure they are 'climate-scientific-specific' if you don't compare them with other assessments? Similarly, you don't explain or reference why "the IPCC assessment is perceived as controversial". There have been some controversies associated with the IPCC assessments but I am not sure the assessments themselves are controversial. Likewise, you state that "In its role as a science-policy mediator, the Panel underpinned important multilateral environmental agreements on tackling climate change such as the Kyoto Protocol and the Paris Agreement". How did it underpin them? Can you provide some supporting references?

Second, you cite some other works describing what an assessment is in footnote 2, but I think your work would benefit from a deeper look at the literature on scientific advice mechanisms for policy. For example, there is a difference between scientific research, scientific assessments and policy advice. In my view, assessments do not, as you claim, "Identify gaps in the scientific knowledge relevant to the problem and, by doing this, establish research priorities and stimulate research that can be used to solve the problem" and "Produce new knowledge relevant to the

particular problem” (this is done by scientists in scientific research) or “Use the existing knowledge to find solutions to the problem” and “Provide expert opinion on problems that involve a high degree of uncertainty or about which there is a lack of sufficient information for a proper scientific quantification” (this is done by policy advisors in policy advice). If the IPCC merely assesses science, then any errors it produces would not be errors from the assessments but rather errors in the underlying science. Hence, it should not be held accountable for this, as you suggest in section 5. It also does not produce policy recommendations because its aim is to be policy-relevant not policy-prescriptive, thus it should not be held accountable if the policy ideas presented in the reports do not work in the real world. In fact, the only way in which the assessment can go wrong is if it is not comprehensive or if it misrepresents the underlying science.

Third, for audiences unfamiliar with philosophical research paper, it would be good to clarify what you mean by “this is the result of an epistemological effort” and why it is a good fit for the problems you raise.

Fourth, one of the main arguments in the text is that, despite the IPCC claiming that its job is merely to assess and not conduct original research, some of the work report authors do can be understood as conducting research and that this is troublesome because it is not conducted systematically. However, the argument can be improved by clearly defining how 'assessment' and 'research' differ. It seems to me that your supporting example with ECS counters your argument because the reliance on the authors' scientific expertise is precisely how I would define 'assessment'. I am also not convinced of your argument that "putting together different lines of evidence and filling holes in research, got the IPCC involved in conducting new research". I don't see how the emphasis on consensus or quantifying uncertainty counts as conducting new research or filling holes in evidence. Further, you do not mention that the reports undergo a peer review process, similar to other scientific work.

Some other minor notes:

In the introduction you state that “Part of its job is to provide policymakers with the necessary information for making the best decisions in addressing this problem.”. While in the abstract you state that “main objective is to supply policymakers with policy-relevant recent scientific information about climate change.”. Which is it? The main job or part of its job? If the latter, what is the other part?

You miss the fact that the IPCC’s assessment style may have changed, particularly from AR1 to AR6. You treat the work of all IPCC Working Groups as the same, yet most of your examples are from Working Group 1.

Is the work original in terms of material and argument?

Yes

Does it sufficiently engage with relevant methodologies and secondary literature on the topic?

No

Is the work clearly and cogently presented?

Partly

Is the argument persuasive and supported by evidence?

No

If any, are all the source data and materials underlying the results available?

No source data required

Does the research article contribute to the cultural, historical, social understanding of the field?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Science-policy interface, IPCC, Climate change mitigation

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

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The article offers an in-depth analysis of the assessment process used by IPCC. The main goal is to provide insights into the specific type of assessment the IPCC performs and the factors that shaped it.

The manuscript starts by exploring the origins of the IPCC and the reasons for its creation. Therefore emphasizes on climate-scientific-specific obstacles that the IPCC faced, such as the integration of interdisciplinary knowledge, the need for consensus-building, uncertainty quantification, and addressing gaps in knowledge. Finally, the author explores some controversies surrounding the IPCC's assessments, which arise from the specific ways it addresses these scientific challenges.

There are some points that could improve this manuscript:

1. The article could benefit from a clearer, more structured definition of what "assessment style" means, particularly in distinguishing the IPCC's approach from other expert organizations. For instance, a table or framework contrasting the IPCC's assessment style with other global organizations would enhance clarity.

2. While the obstacles are well-explained, the article could delve deeper into how these scientific challenges have evolved over time. For example, the discussion could highlight how the handling of uncertainty or interdisciplinary integration has improved (or not) across IPCC reports, especially in the transition from AR5 to AR6.

3. Regarding Section 5.2. Can the authors offer more specific suggestions on how the IPCC could improve its communication of uncertainty?, that would be great

4. More concrete examples of how the IPCC has balanced consensus-building with the need to represent scientific diversity would strengthen the argument.

Is the work original in terms of material and argument?

Yes

Does it sufficiently engage with relevant methodologies and secondary literature on the topic?

Yes

Is the work clearly and cogently presented?

Partly

Is the argument persuasive and supported by evidence?

Partly

If any, are all the source data and materials underlying the results available?

No source data required

Does the research article contribute to the cultural, historical, social understanding of the field?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Climate Change, Climate models, Artificial Intelligence and Oceanography

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 16 October 2024

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**Hannah Hughes**

Aberystwyth University, Aberystwyth, Wales, UK

This article sets out to address really important questions about the IPCC and its assessment style: asking what exactly is it that the Panel is doing, why is it doing it in that particular way and why what it does was/is perceived by some as controversial? I am reviewing the article you have written to address these questions from the standpoint of someone who has attempted to address very similar questions and provided a detailed account of the organisation and its practice for producing assessments of climate change (Hughes 2015; Hughes and Paterson 2017; Hughes 2023; Hughes 2024). You do not have to engage with all of these, but as with the literature identified below, doing so may help you to further articulate and strengthen the unique contribution that you are attempting to make in your article and to situate this in relation to existing scholarship.

From the outset of your article, you suggest that there are two strategies for tackling these questions: 1) to focus on social and political factors in the organisations establishment and 2) concentrate on the climate-scientific-specific obstacles that the Panel had to overcome in trying to do what it has been mandated by the UN General Assembly (UNGA). You indicate that by looking at the solutions the panel found for dealing with these obstacles we can essentially 'know' its assessment style and shed light on the controversies this has created. You identify the climate-scientific-specific obstacles as: 1) the need to address consensus-issues, 2) the inherent uncertainty of climate-scientific results, 3) the interdisciplinary nature of climate research, and 4) the gaps in knowledge relevant to climate change. You conclude the Panel's response to these obstacles acted as both the main constraining factor on its assessment style and the principal source of controversies associated with it over social and political factors (and presumably accounts of this assessment style). I find this conclusion a bit troubling however, for the following reasons:

First, you don't tell us what the strategy of exploring the IPCC/assessment style through social and political factors has taught us. This literature is not reviewed and you do not indicate where our understanding or knowledge is lacking as a result of following this strategy. Without knowing what the present gap in understanding is it is hard to determine what you contribute by taking this alternative strategy and focusing on the climate-scientific-specific obstacles.

Second, is it a new approach? Many scholars interested in the IPCC have tried to understand how the IPCC has addressed the climate-scientific-specific obstacles that you provide an account of, but you don't review these and at one point even indicate there isn't the space to provide this review (I am thinking here particularly of some of the early STS literature on the IPCC and uncertainty e.g. work by Brian Wynne and Simon Shackley). There may not be the space for a thorough review of this scholarship, but you can provide an account of what we know and what you're showing us differently with reference to these.

Thirdly, what about those scholars that have considered both and built both factors into their frameworks and analyses? Many scholars from the outset would indicate that addressing the question you set out with cannot be answered with an either or approach. They have adopted different concepts and methods to capture this, revealing how the scientific order (conventions, practices and forms of authority) informed leaders approach to fulfilling the practical task of producing the assessment combined with an account of the social and political forces structuring the emergence of the organisation and its assessment practice (Hughes 2024; but also accounts

informed by metaphor of co-production e.g. Miller 2004). Through close up examination of particular shifts across assessment cycles, in relation to WAIS for example, this scholarship illuminates the interplay between science and cultural forces in the assessment of a specific topic (O'Reilly, Oreskes and Oppenheimer 2012).

I am sure your article has unique insights and a contribution to make on how climate-scientific-specific obstacles are overlooked in how we understand the IPCC's assessment style (although, I don't think that you can know the organisation or its assessment practice through these alone). However, to demonstrate the importance of taking this focused approach you need to develop more nuance in your argument through engaging more carefully and thoroughly with what we know and how we know what we do about the IPCC today, and then showing us what we could understand differently and more clearly through your research strategy.

Finally, your use of 'panel' and IPCC may need more consideration to bring greater clarity to exactly who in the organisation or which part of the organisation you are referring to. This really becomes noticeable as the article progresses and you begin to articulate and illustrate the central elements e.g.: *In trying to overcome the first obstacle (i.e. the hidden errors in the research), the IPCC had to act as an epistemic authority in charge of providing quality control for all the research output relevant to the question of climate change.* But who are you referring to as the IPCC here? I notice you're not using panel anymore, e.g. member governments. Do you mean the bureau. They are likely to be discussing it and dealing with it in a very practical way at the outset and during an assessment cycle, and it's very likely that the co-chairs and the technical support units will develop papers and guidance notes to inform authors on how to tackle the specific issues you raise (grey literature, cut off date for publication, guidance on treatment of uncertainty), as well as checking the draft chapters and harmonising the final report to ensure these are adhered to.

Below I list some of the articles and books that I have written to try to address similar questions about what the IPCC is? What it does? And how it came to be this way? Importantly, I was driven by a different underlying question, namely what constitutes symbolic power/authority to determine the meaning of this collective problem? However, when I set out to address this question, learning with/from existing IPCC literature and then progressed to the interview stage, it quickly became apparent that this scholarship didn't yet provide a detailed account of what the IPCC is and does, which became an important motivation for my research and the outputs below.

Hughes, H. '2024 Ref 1

Hughes, H. 2024. Ref 2

Hughes, H. 2015 Ref 3

Hughes, H. 2017 Ref 4

Miller, C. (2004) Ref 5

O'Reilly, J., Oreskes, N., & Oppenheimer, M. (2012) Ref 6

Shackley, Simon, and B. Wynne. 1995. Ref 7

Shackley, S, and B Wynne. (1996) Ref 8

Shackley, S., P. Young, S. Parkinson, and B. Wynne. (1998) Ref 9

References

1. Hughes H: Actors, activities, and forms of authority in the IPCC. *Review of International Studies*. 2024; **50** (2): 333-353 [Publisher Full Text](#)
2. Hughes H: The IPCC and the Politics of Writing Climate Change. 2024. [Publisher Full Text](#)

3. Hughes H: Bourdieu and the IPCC's Symbolic Power. *Global Environmental Politics*. 2015; **15** (4): 85-104 [Publisher Full Text](#)
4. Hughes H, Paterson M: Narrowing the Climate Field: The Symbolic Power of Authors in the IPCC's Assessment of Mitigation. *Review of Policy Research*. 2017; **34** (6): 744-766 [Publisher Full Text](#)
5. States of Knowledge. 2004. [Publisher Full Text](#)
6. O'Reilly J, Oreskes N, Oppenheimer M: The rapid disintegration of projections: the West Antarctic Ice Sheet and the intergovernmental panel on climate change. *Soc Stud Sci*. 2012; **42** (5): 709-31 [PubMed Abstract](#) | [Publisher Full Text](#)
7. S, Simon B, Wynne: Global Climate Change: The Mutual Construction of an Emergent Science-Policy Domain. <https://www.research.ed.ac.uk/en/publications/global-climate-change-the-mutual-construction-of-an-emergent-scie>. 1995.
8. Shackley S, Wynne B: Representing Uncertainty in Global Climate Change Science and Policy: Boundary-Ordering Devices and Authority. *Science, Technology, & Human Values*. 1996; **21** (3): 275-302 [Publisher Full Text](#)
9. S, Shackley P, Young S, Parkinson B, et al.: Uncertainty, complexity and concepts of good science in climate change modelling: Are GCMs the best tools?. <https://www.research.ed.ac.uk/en/publications/uncertainty-complexity-and-concepts-of-good-science-in-climate-ch>. 1998.

Is the work original in terms of material and argument?

Partly

Does it sufficiently engage with relevant methodologies and secondary literature on the topic?

Partly

Is the work clearly and cogently presented?

Yes

Is the argument persuasive and supported by evidence?

Partly

If any, are all the source data and materials underlying the results available?

Partly

Does the research article contribute to the cultural, historical, social understanding of the field?

Partly

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 14 October 2024

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Kari De Pryck

University of Geneva, Geneva, Switzerland

The article explores the type of assessment the IPCC performs. While the question is interesting, the research protocol is, in my view, unsatisfactory. From a social science perspective, the paper lacks a clear theoretical framework, methodology, and analytical protocol.

First, the paper should be more firmly situated within Science and Technology Studies (STS), as many of the articles cited rely on STS frameworks. STS scholars, by focusing on practices, have demonstrated that assessment-making involves expert judgment and discernment. Oppenheimer et al.'s definition of assessment as “a kind of discernment, where experts gather and evaluate evidence and attempt to discriminate among diverse, competing, and sometimes conflicting claims” is particularly relevant. From an STS perspective, there isn't a single way to conduct an assessment, but multiple approaches, shaped by cultural and institutional factors – see in particular Ref 1.

The following two articles have also shown how characterizing uncertainty involves cultural and social factors.

Mach, K.J. et al. (2017) Ref 2 Swart, R. et al. (2009) Ref 3

Second, it is unclear how the author distinguishes between 'climate-scientific-specific' and social and political factors, as well as the rationale for making such a distinction. In my view, the analysis underscores the importance of social, cultural, and political factors in understanding the assessment process within the IPCC. Questions such as how rules and procedures shape the assessment, the definition of the mandate, and the AR4 errors are crucial. For instance, the errors regarding the Himalayan glaciers are tied to the use of grey literature in the assessment, the role of review editors in identifying errors (external reviewers had flagged them), and the Bureau's delayed acknowledgment of the mistakes—thus highlighting social and institutional factors. See the following articles

O'Reilly, J. (2015) Ref 4” in J. Barnes and M.R. Dove Ref 5

Beck, S. (2012) Ref 6

De Pryck, K. (2021) Ref 7

Third, the methodology requires clarification and enhancement. First, I recommend that the author use databases such as Scopus or Web of Science to identify a comprehensive set of articles for the review. Second, while the example of the ECS is interesting, the analysis should not be solely based on report assessments. I encourage the author to conduct interviews with the IPCC authors responsible for assessing ECS in AR6 to gain insights into how they arrived at the final figures, as well as to analyse the review comments.

References

1. O'Reilly J, Oreskes N, Oppenheimer M: The rapid disintegration of projections: the West Antarctic Ice Sheet and the intergovernmental panel on climate change. *Soc Stud Sci*. 2012; **42** (5): 709-31 [PubMed Abstract](#) | [Publisher Full Text](#)
2. Mach K, Mastrandrea M, Freeman P, Field C: Unleashing expert judgment in assessment. *Global Environmental Change*. 2017; **44**: 1-14 [Publisher Full Text](#)

3. Swart R, Bernstein L, Ha-Duong M, Petersen A: Agreeing to disagree: uncertainty management in assessing climate change, impacts and responses by the IPCC. *Climatic Change*. 2009; **92** (1-2): 1-29 [Publisher Full Text](#)
4. O'Reilly J: 4. Glacial Dramas: Typos, Projections, and Peer Review in the Fourth Assessment of the Intergovernmental Panel on Climate Change. 2020. 107-126 [Publisher Full Text](#)
5. J, Barnes M R, Dove: Climate Cultures Anthropological Perspectives on Climate Change. <https://yalebooks.yale.edu/book/9780300198812/climate-cultures>. 2015.
6. Beck S: Between Tribalism and Trust: The IPCC Under the "Public Microscope". *Nature and Culture*. 2012; **7** (2): 151-173 [Publisher Full Text](#)
7. De Pryck K: Controversial Practices: Tracing the Proceduralization of the IPCC in Time and Space. *Global Policy*. 2021; **12** (S7): 80-89 [Publisher Full Text](#)

Is the work original in terms of material and argument?

Partly

Does it sufficiently engage with relevant methodologies and secondary literature on the topic?

No

Is the work clearly and cogently presented?

Partly

Is the argument persuasive and supported by evidence?

Partly

If any, are all the source data and materials underlying the results available?

No source data required

Does the research article contribute to the cultural, historical, social understanding of the field?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: IPCC, social studies of science

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Reviewer Report 01 October 2024

<https://doi.org/10.21956/openreseurope.19558.r44601>

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Tomàs Molina 

University of Barcelona, Barcelona, Catalonia, Spain

This piece reads more like an essay or commentary on the issue of the IPCC assessments rather than a traditional research article. While the subject is highly relevant, and the discussion is well-executed and of great interest, the text can be difficult to follow at times. The treatment of footnotes and references is somewhat confusing due to multiple approaches to consultation. Overall, I believe the article is ready for approval with minor revisions.

Suggestions for improvement:

- Section 2: It would be helpful to mention the First World Climate Conference (1979), which led to the creation of UNEP and, eventually, the IPCC.
- Section 3: The reference to "(p.57)" is unclear, particularly concerning which book or paper is being cited. If it pertains to Reference 1, the phrase "family resemblance" only appears once, on the first page. I haven't checked all page references, but they seem somewhat confusing.
- Section 3.1: The acronym "UNGA" has not been defined.

Main Question for the Author:

The research question, as stated in the introduction and title—"What follows is the result of an epistemological effort to identify those climate-scientific-specific factors that were at least very important, if not crucial, in shaping the IPCC's assessment style"—does not fully align with the conclusions. The conclusion states: "The main objective of this paper was to explore a different strategy for accounting for an important aspect of the IPCC's activity: the type of assessment that it performs in order to obtain policy-relevant scientific information about climate change."

After such an in-depth discussion that often circles back, it would be beneficial to expand the conclusions by summarizing some key points from the discussion. This would help in identifying the "climate-scientific-specific factors" that were instrumental in shaping the IPCC's assessment style. As it stands, the conclusions feel too brief and vague, especially considering the length of the preceding discussion.

References

1. Castree N, Bellamy R, Osaka S: The future of global environmental assessments: Making a case for fundamental change. *The Anthropocene Review*. 2021; **8** (1): 56-82 [Publisher Full Text](#)

Is the work original in terms of material and argument?

Yes

Does it sufficiently engage with relevant methodologies and secondary literature on the topic?

Yes

Is the work clearly and cogently presented?

Yes

Is the argument persuasive and supported by evidence?

Yes

If any, are all the source data and materials underlying the results available?

No source data required

Does the research article contribute to the cultural, historical, social understanding of the field?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Meteorology, Climate Change Communication

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.
