Values and Objectivity in the Intergovernmental Panel on Climate Change

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Abstract. The assessments issued by the Intergovernmental Panel on Climate Change (IPCC) aim to provide policy-makers with an objective source of information about the various causes of climate change, the projected consequences for the environment and human affairs, and the options for adaptation and mitigation. But what, in this context, is meant by "objective"? In practice, in an effort to address internal and external criticisms, the IPCC has regularly revised its methodological procedures; some of these procedures seem to meet the requirements of objectivity, at least as understood in a specific sense, but the relationship between objectivity and value-neutrality requires further investigation. The aim of this paper is to offer an appropriate philosophical account of objectivity, reconcilable with the fact that the IPCC is not value-free. I argue that Sandra Harding's notion of strong objectivity is particularly well suited to this goal, and I examine the extent to which the current IPCC procedures match her account.

1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP). Today it enlists hundreds of scientists whose objective is to provide policy-makers with up-to-date scientific reports about climate change, and is widely considered to be the leading international authority in this area. The IPCC's Assessment Reports (ARs) contain surveys, reviews and assessments of the relevant recent scientific, technical and socioeconomic information that is being produced worldwide;[1] the IPCC does not conduct its own scientific research and so does not directly create new knowledge.[2]

The IPCC assessments aim at informing governments about climate change so as to assist in the development of climate-related policies, and at making a similar contribution to negotiations at the UN Climate Conference. In this capacity, the IPCC claims that its work is "policy-relevant and yet policy-neutral, never policy-prescriptive" (IPCC Organization); the assessments "may present projections of future climate change based on different scenarios and the risks that climate change poses and discuss the implications of response options, but they do not tell policymakers what actions to take" (IPCC Factsheet: What is the IPCC?).

The IPCC thus sets itself the goal of maintaining *objectivity* in its reports, alongside other epistemic virtues including comprehensiveness, openness and transparency. The ARs are drawn up by three Working Groups (WG) dealing respectively with the physical science basis of climate change (WGI); climate change impacts (WGII); and adaptation, vulnerability and mitigation (WGIII). The three WGs aim to provide policy-makers with an objective source of information about the causes of climate change, the consequences for the environment and for human activities that have already been observed as well those projected for the future, and the possible options in terms of adaptation and mitigation.

[1] Other significant documents are also produced, such as the Summaries for Policy-Makers (SPMs).

[2] The fact that the IPCC does not on its own produce new knowledge does not exclude that the IPCC may motivate and guide future research in climate science. The ARs are certainly very useful for pointing out shortcomings and lacunae in our knowledge of climate change, and thereby identifying the domains requiring more scientific investigation.

> The role of the IPCC is to assess on a comprehensive, *objective*, open and transparent basis the scientific, technical and socio-economic information […] IPCC reports should be *neutral* with respect to policy, although they may need to deal *objectively* with scientific, technical and socio-economic factors relevant to the application of particular policies. (IPCC Principles governing work, p.1, *emphases mine*)

Yet what, in this context, is meant by "objectivity"? And how in practice does the IPCC aim for it? The IPCC is a social organisation that is in a state of constant evolution. Even as it updates the scientific content of its reports—every five or six years—the IPCC also adapts its methodological procedures to the problems encountered by the preceding ARs (Beck 2012, 2013; Leclerc 2015). The IPCC is prone to internal and external criticism, and, in an effort to address it, regularly revises its procedures. As a consequence, we cannot expect objectivity—other than in its very broad outline—to have been defined *a priori* by the IPCC, or appropriate procedures to have been designed accordingly. But we can certainly expect to find that some procedures have been chosen, and revised (possibly in a rather *ad hoc* way), in order to meet the requirements of *some* standards of objectivity. Striking examples of such procedures are the method of author team selection, the multiple rounds of review for each report, and the IPCC's Conflict of Interest Policy, which together aim at reaching a "Balanced assessment of the full range of scientific views, protected from the influence of special interests" (IPCC Factsheet: How does the IPCC select its authors?).

A philosophical account of objectivity is therefore required that suits the case of the IPCC, and can be used to evaluate current procedures and perhaps help to design new ones. My aim in this paper is to offer such an account. Importantly, the paper claims that such a philosophical account of objectivity must be reconcilable with the frequently overlooked fact that the IPCC, contrary to its claims, is inevitably value-laden (John 2015, vs. Betz 2013). I argue, indeed, that non-epistemic values pervade the process of writing the ARs, and are manifest on different levels (section 2). I contend that, given the methodological context and the specific requirements of the ARs, Sandra Harding's account of strong objectivity is particularly well suited for illuminating the case of the IPCC (section 3).[3] Strong objectivity is obtained when a representative diversity of standpoints, including those from marginal positions, is taken into account (Harding 1992). The reason why strong objectivity is well suited will become clear: the IPCC is an organisational apparatus which mobilises scientists all around the world, and whose outputs, ideally, should inform all governments worldwide while taking account of their diverse priorities and interests. Finally, I assess the extent to which the current IPCC procedures actually match the criteria of strong objectivity (section 4).

2. The IPCC is not value-free

The value-free ideal in science is "the view that non-epistemic values are not allowed to intrude the decision-making processes that scientists are engaged in when they accept something as scientific knowledge" (Rolin 2015, p. 158). Non-epistemic values are contextual, and can be social, political, economic or ethical in nature.[4] They contrast with the epistemic values that are the considerations pertinent for assessing the extent to which a scientific representation matches the targeted system or phenomenon; examples of the latter commonly include accuracy, consistency, simplicity, breadth of scope and fruitfulness (Kuhn 1977, p. 320–339).

Although the IPCC is not a scientific research body, but rather an institution which is engaged in

[3] Miller (2015) also considers Longino's procedural objectivity and Harding's strong objectivity as possibly applying to the IPCC, but he reaches opposite conclusions. This is due, I believe, to the fact that we differ on what we see as the IPCC ARs' main aim: the IPCC, I believe, does not aim for consensus on every subject matter, but rather endeavours to reflect the diversity of scientific perspectives and to address the reasons for possible disagreements.

[4] That said, contextual values are not always non-epistemic. In particular, as Rolin makes clear (2015), moral and social values can play a legitimate role in scientists' decisions to accept something as scientific knowledge.

the production of (a very large quantum of) expertise, it is still worth asking whether the IPCC deploys non-epistemic values when assessing the scientific literature for the purpose of informing policy-makers. In this context, it is probably more useful to appeal to the *linear model* of scientific expertise rather than the value-free ideal as applied to science in understanding the role of values in the IPCC's work. According to the linear model, the process of producing expertise and the representation of social groups' interests should be construed as two distinct phases (Guston 2000, chap. 5; Godin 2006). The process of producing expertise ought to be free from non-epistemic values: although these values may orientate the questions that experts are expected to answer, they should not interfere with the process of producing the expertise itself. In the linear model, this is the sense in which scientific expertise should be "value-free".

Betz (2013) argues that the IPCC process is indeed value-free. However, his argument has been the subject of criticism (John 2015) and, as will become clear, even if correct his argument applies only to a specific level of the IPCC's overall process. I will return to the debate between Betz and John later in this section. First, though, I want to make the broader point that non-epistemic values pervade the IPCC at *multiple* levels, i.e., (i) in building the climate models whose projections are used in the reports (Intemann 2015; Parker and Winsberg 2018); (ii) in assessing the scientific literature (John 2015); (iii) in assigning degrees of certainty to the key findings (Steele 2012); and (iv) in the perception of risks and the assessment of impacts (Tuana 2017). I deal with these four points in turn.

(i) The IPCC assessments rely heavily on projections and other outputs from selected climate models, including general circulation models—the latter being complex mathematical representations of the climate system encompassing the atmosphere, oceans, land surface, ice sheets and more. All such representations are approximate, the projections they furnish uncertain, in part because available computer power is limited and so imposes restrictions on model complexity, and in part because some physical, biochemical and socioeconomic components relevant for the climate system are still poorly understood. Therefore, climate model building requires scientists to define the purposes and priorities that the model is expected to attain. Yet, as has recently become widely recognised, non-epistemic values can shape the setting of purposes and priorities and thereby determine what features of the climate system models should account for (Biddle and Winsberg 2009; Winsberg 2012; Intemann 2015; Parker and Winsberg 2018). [5] Here, "purposes and priorities shape not just which entities and processes are represented in a model but also how they are represented, including which simplifications, idealizations and other distortions are more or less tolerable" (Parker and Winsberg 2018, p. 128).

Simplifications and distortions are deemed tolerable or even appropriate when the choice and the design of a model are driven by epistemic considerations. But problems can sometimes arise when choice and design are driven by non-epistemic values, except when, for example, and as Intemann (2015) argues, the values at work promote social and epistemic aims for research which have been democratically endorsed.

Some purposes and priorities may depend on the ethical values at work when the initial choice is made of which model to build. As Intemann (2015) illustrates, if one is ethically concerned with how to adapt to worst-case scenarios, models should be built to capture extreme weather events. If one feels a moral obligation to protect future generations, models should be designed to scaffold our understanding of events that play out over more than a century.

Other purposes and priorities may depend on regional interests, such as a research team's interest in knowing the specific climate future of their home country. Clearly, research centres in India would probably have greater interest in changes in the timing of monsoons than melting sea

[5] In the context of these discussions, important questions that have been addressed are (i) whether values are legitimate for deciding which assumptions should be built into climate models and how; (ii) whether on the contrary they lead to "wishful thinking" or to the tuning of decisions "based on what we wish the model would predict rather than decisions about what will make the model more accurate or accountable to the 'way the world really is' (Brown 2013)" (Intemann 2015, p. 221); and (iii) whether value influence can be entirely cancelled or avoided (Parker and Winsberg 2018).

ice, while the opposite is likely the case for Canadian centres.

From another perspective, the very fact that climate models and model projections are so highly valued in the ARs produced by all three IPCC WGs is sometimes itself perceived as a bias. Physico-chemical considerations and numerical modelling are generally considered as guarantors of objectivity; but, as Dahan and Guillemot (2015) report, some scientists in the Global South consider such models to reduce climate change to a mere physico-chemical problem, treating greenhouse gases purely as molecules to be measured for their global warming potential, thereby erasing the social dimension of greenhouse gas emissions, in particular the difference between the "survival emissions" of the South and the "luxury emissions" of the North. For these scientists, the numerical approach to climate change is an " "excessively physics-based," globalizing vision that treats the current moment in time as neutral; whereas in fact the initial situation—1990, in reference to the Kyoto Protocol—is not a natural given but derives from a combination of historically produced political, economic, or social conditions" (Dahan and Guillemot 2008, p. 213). Some such scientists also consider numerical modelling to be a "Northern language" "that erases the past, normalizes the present and globalizes the future" (*ibid*.).[6]

(ii) Notwithstanding that non-epistemic values pervade climate modelling, we might nevertheless think that the act of reviewing and assessing the state of knowledge in climate science, in contrast to the act of producing *new* knowledge, is indeed value-free. However, in the practice of the IPCC, the way the scientific literature is appraised as relevant or significant does clearly involve non-epistemic values. Notably, not all the relevant papers receive the same degree of attention and appreciation from the authors of the ARs; there are clear and explicit preferences. As the IPCC recommends, "In the assessment process, emphasis is to be placed on the assurance of the quality of all cited literature. Priority should be given to *peer-reviewed* scientific, technical and socio-economic literature if available" (IPCC Appendix A, Annex 2, Procedure on the use of literature in IPCC reports; *emphasis mine*)

Furthermore, in the IPCC documentation there is a special notification concerning the use of non-published and non-peer-reviewed sources, identified as "grey literature". The IPCC stipulates that "Although highly relevant information can be contained in the grey literature, use of this literature brings with it an extra responsibility for the author teams to ensure the quality and validity of cited sources and information" (IPCC decisions taken with regards to the recommendations from the review by the InterAcademy Council). For instance, any citation of grey literature must specify the authors of that grey literature, their qualifications, source of funding, possible biases or hidden agendas, the extent to which the citation is necessary, how well it has been reviewed, and explain why the document was not published in a peer-reviewed journal in the first place.

The preference for peer-reviewed literature and the request for additional information about grey literature clearly indicates that the following assumption is in play: claims in peer-reviewed journals are more likely to be true than those in grey literature. The adoption of such an assumption can be explained not just by the general background belief that anonymous peer review helps to cancel out flaws in science, but also by the need for the IPCC to avoid external criticism (Alexander et al. 2011, p. 477), and by the impact of the earlier controversy over the AR4's mistaken projection of the melting of Himalayan ice caps, which arose partly from reliance on non-peer-reviewed sources (Pearce 2010). However, even though this preference can to some extent be justified, it may be seen as a bias in that, as John points out, failing to include reports from the grey literature "clearly runs a risk of excluding some true reports from the IPCC's evidence" (John 2015, p. 7) and thus may impede or slow the progress of science.

In addition to decisions about what literature to include, the very act of reviewing may also involve a series of normative decisions, for instance concerning the space allocated to any given topic, or the approach taken to conflicting arguments (Ford et al. 2016, p. 349). All such decisions may be

[6] This bias might arise in the first instance from the fact that the ARs of WGI are generally often treated as the core element of the IPCC's output, and seen as providing the basis for the ARs of WGII and WGIII, which are more socio-economic.

based on non-epistemic values that are left to the judgement of the authors.

(iii) What about the assignment of degrees of certainty to the key findings? A form of careful and calibrated language has been designated for use by the Lead Authors of the Fifth Assessment Report (AR5) with a view to communicating the degree of certainty in the key findings in a consistent fashion across all three Working Groups (WGs). Quantitative and qualitative metrics are both used, involving measures of the uncertainty of a finding on one side, and levels of confidence in a finding on the other.

In the most favourable cases, measures of uncertainty are expressed probabilistically. The measures "may be based on statistical or modeling analyses, elicitation of expert views, or other quantitative analyses" (Mastrandrea et al. 2010, p. 3). The degrees of certainty are given linguistic expression through the standardised terminology of "exceptionally unlikely, very unlikely, unlikely, about as likely as not, likely, very likely, virtually certain". They aim to map the corresponding range of probability of: 0-1%, 0-10%, 0-33%, 33-66%, 66-100%, 90-100% and 99-100% (Mastrandrea et al. 2010).

Levels of confidence are also expressed qualitatively using five descriptors: "very low," "low," "medium," "high" and "very high." The assignment of a descriptor depends "on the type, amount, quality, and consistency of *evidence* (e.g., mechanistic understanding, theory, data, models, expert judgment) and the degree of *agreement* [between different sources relative to a same finding]" (Mastrandrea et al. 2010, p. 1) Summary terms for evidence are "limited," "medium" or "robust". Summary terms for the degree of agreement are "low," "medium" or "high".

Examples of the use of such descriptors in AR5 are:

- "In the Northern Hemisphere, 1983–2012 was *likely* the warmest 30-year period of the last 1400 years *(medium confidence*)." (WGI)
- "Globally, it is unlikely that the number of [extratropical cyclones] ETCs will fall by more than a few percent due to anthropogenic climate change (*high confidence*)." (WGII)
- "In nearly all countries it is *very likely* that the main short-term driver of changes in the level of emissions is the overall state of the economy. In some countries there is also a significant role for climate policies focused on controlling emissions. (*medium evidence, medium agreement*)." (WGIII)

Betz (2013) considers the use of such calibrated language, and in particular the assignation of likelihoods, to be the primary reason why the IPCC is seen as an "instance of value-free science". He argues that, for these reasons, the IPCC is a counter-example to the argument against the feasibility of excluding non-epistemic values from scientific justification in the presence of inductive risk (Rudner 1953; Douglas 2009). The IPCC's methodological approach avoids value-laden decisions by making uncertainties explicit and by carefully articulating the findings they rely on in the ARs.

Briefly, Betz's view can be summarised as follows: Scientists must accept or reject scientific hypotheses. They adopt either "plain hypotheses" of the form "all As are Bs", or "hedged hypotheses" of the form "it is very probable that all As are Bs". According to the argument from inductive risk, because the first case involves a substantive risk of error, scientists must appeal to non-epistemic values in assessing whether errors can be tolerated, thus violating the value-free ideal. By contrast, in the second case, they can confirm the hypotheses beyond reasonable doubt based on the available evidence, without appealing to non-epistemic values. As Betz claims, the IPCC ARs typically report hedged hypotheses about the likelihood of the various causes, the possible futures for climate change, as well as the potential means of adaptation and mitigation, thus making the IPCC process value-free.

John (2015) makes a number of convincing objections against Betz's position.[7] In particular, drawing on Steele (2012), John argues that even if climate scientists can limit themselves to assigning epistemic probabilities to hypotheses, and need not in this context make non-epistemic value-judgments, the IPCC would still expect from them that they translate "these probabilities into coarse-grained qualitative measures of certainty" (John 2015, 3) (such as "medium confidence" or "high confidence"). And yet this practice in turn leaves leeway for non-epistemic value-judgments, such as, "in Steele's example (Steele 2012, p. 898), whether being 0.6 confident counts as "high confidence" ("about 8 out of 10") or "medium confidence" ("about 5 out of 10")" (Ibid.). Not only does this not lead to a "binary choice" between adopting or rejecting a plain hypothesis, but the translation "might itself involve (substantive, not trivial) risks of error, and seems subject to the methodological critique [i.e., to the argument from inductive risk]" (Ibid.).

In other words, while the use of calibrated language might be thought to be a way to avoid non-epistemic values, in practice it simply does the opposite. Additionally, a number of psychological papers have shown that the criteria used by the IPCC for assigning degrees of certainty to the key findings are ambiguous and subject to multiple interpretations (e.g., Budescu et al. 2009, 2012; Harris and Corner 2011; Harris et al. 2013). The calibrated language is not understood the same way irrespective of cultural differences, e.g., between British English and Chinese translations. Indeed, the equivalences between the qualitative terms for likelihood and the corresponding ranges in terms of probability are not even intuitive. The terms of likelihood are also ambiguous with respect to context—in particular if risk must be taken into account (e.g., in the cases of severe consequences). As is recognised by the IPCC itself, "there is evidence that readers may adjust their interpretation of this likelihood language according to the magnitude of perceived potential consequences" (Mastrandrea et al. 2010, p. 3).

(iv) An additional important element dealt with by the IPCC concerns the assessment of risks and harm, and yet the way risks and harm are perceived depends on one's cultural background as well as normative judgements of what counts as harm. Therefore, such assessment may also involve non-epistemic values.

This is what Tuana persuasively shows (2017) when she develops the example of the colloquially named "burning embers" diagram. This diagram was created by the IPCC to communicate the risks of rising global temperatures. In the diagram, five main "reasons for concern" are defined: risks to unique and threatened systems, risks of extreme weather events, distribution of impacts, aggregate impacts, and risks of large-scale discontinuities (McCarthy et al. 2001, chap. 19). As Tuana argues, the selection of the five key reasons for concern, with the implicit assumption that they are exhaustive, involves "complex value judgments".[8] She focuses particularly on the problem with "aggregate impacts," which "obscures the fact that relatively low aggregate harms is still compatible with very high levels of harm for some groups of people and for some ecosystems" (2017, p. 39). In particular, defining the threshold of increase in the average surface temperature as 2°C does not take into account that, for some populations—especially those from poorer countries—and for some ecosystems, 2°C is simply not an acceptable level of harm. Even with warming of 1°C there are "flora and fauna range shifts: increasing [incidents of] malaria (+300,000 deaths); extreme weather events […] severe food disruptions in the Sahel region of Africa" (Seager 2009, p. 16). The problems with aggregating impacts include determining "which ones count most, e.g., income generating activities, and which harms and benefits do not count or count less, e.g., emotional well-being or ecosystem flourishing" (Tuana 2017, p. 40).

Note that in this section we have analysed the influence of values independently of the different

[7] John (2015) also argues that: (i) the way Betz frames the argument from inductive risk—also called the methodological critique—is mistaken; (ii) reporting hedged hypotheses is not a guarantee of being value-free since it is only done relative to *some* body of evidence, and yet the IPCC hardly takes into account grey literature; (iii) there is an alternative way of defending the idea that the IPCC is value-free, but then the IPCC reports would become so complicated that to render them useful to policy-makers would require "interpreters" (p. 9).

[8] See also Leuschner (2016). She presents the history of the burning embers diagram since 2001, and demonstrates that the IPCC has consistently underestimated the risks of the five reasons for concern.

subject matters addressed by the three WGs. Thus, this analysis needs to be completed by a comparative study of the influence of values within the three WGs. Certainly, the possible inclusion of non-epistemic values might be perceived differently in the different WGs, since they rely on distinct methodologies appropriate to their specific subject matters, and have their own epistemic criteria and requirements.[9]

In brief, the IPCC assessments make use of selected climate models and the projections based on them; their reviews are performed based on a selection from the scientific literature, with a preference for the peer-reviewed; they assign degrees of certainty to the key findings relying on inconsistent measures of levels of confidence; and they provide assessments of risks and harm. Non-epistemic values intrude into the process of writing the IPCC ARs on these four different levels. The influence of non-epistemic values is hardly eliminable—or, if it is, only at the cost of making the IPCC process extremely complex, and at the risk of making the reports excessively complicated (John 2015). More than that, some of these values are clearly legitimate, particularly in the case of some of the values that impact on climate modelling and play an ethical role (Intemann 2015). Hence an appropriate philosophical account of objectivity must be reconcilable with the fact that the IPCC's work is indeed value-laden.

3. Diversity of values & epistemic equality

Traditionally, objectivity is identified via the notion of a single point of view, the "view from nowhere" (Nagel 1986). This is used to characterise a relationship between an independent reality and a knower, where the latter must be detached from any point of view that may generate possible biases. The predominant view is the *value-free ideal*, according to which non-epistemic values should not influence the internal workings of science. Such a view might hold in contexts in which values are all "bad", and must be cancelled out, but do not help to illuminate situations in which non-epistemic values play a role, are hardly eliminable, and may even be legitimate.

And yet it is now widely admitted that, in science, values are indeed entrenched in knowledge production, are sometimes not eliminable, and are not always illegitimate. This has been a major contribution made by feminist science studies. While one part of feminist science studies has exposed cases in which non-epistemic values—e.g., those sexist in nature—influence science in pernicious ways, another important part has revealed that certain non-epistemic values can be beneficial in knowledge production (e.g., Longino 2004), and offers alternative accounts of objectivity that accommodate such value-laden situations. These accounts are therefore good candidates to provide an account of the objectivity at work in the IPCC.

Not only must an appropriate account be able to accommodate value-laden situations, but it should also accommodate a diversity of values, since a diversity of different standpoints require to be integrated into the IPCC reports. Let me now argue for this additional requirement:

The IPCC is an intergovernmental body under the auspices of the United Nations. Thus it operates within a space influenced by competing national interests, and there is a risk that the interests of the rich countries of the Global North should prevail over others. In particular, some countries have the scientific infrastructure and financial resources to develop their own regional programmes of modelling and projecting the climate future at the local scale of interest, and also

[9] In particular, because the methodology in WGI is supposed to be based on best practice in the natural sciences, any reference to non-epistemic values would seem to require strong justification. WGII may be more lenient towards non-epistemic values since, clearly, they sometimes play a legitimate role in guiding the assessment of impacts, adaptation possibilities, and vulnerabilities related to climate change. The same is true for WGIII, whose aim is to assess the methods for reducing greenhouse gas emissions and removing carbon dioxide from the atmosphere, thus touching on technological as well as political and social feasibility concerns. That said, the different degrees to which non-epistemic values are tolerated across the three WGs should not entail any changes to the understanding and requirements of objectivity they all endorse. My assumption is that it is still possible to apply one view of objectivity across the three WGs' reports. I am indebted to an anonymous reviewer for encouraging me to make this point clear.

to participate in the worldwide effort of modelling and projecting the climate future at the global scale. This unequal distribution of both economic and epistemic resources can give rise to implicit biases in the ensembles of climate models that serve as the database for the IPCC ARs, and more particularly for the IPCC's WGI which focuses on the physical climate system. The Coupled Model Intercomparison Project (CMIP) is the framework in which standardised simulations of the past, present and future climate are collected and compared in a consistent fashion. In CMIP5, for instance, twenty-three general circulation models have been selected to serve as database: seven models from the USA, three from Japan, two from Canada, two from France, two from the UK, two from China, one from Germany and one from a collaboration between Germany and Korea, one from Norway, one from Australia, and one from Russia. In other words, the resulting ensemble of climate models is more likely to reflect the regional interests of those countries, and therefore more likely to display a bias towards the interests of the rich countries of the Global North. And yet it is true that less attention is paid to some regions of the globe, such as African regions (James et al. 2017). The problem here is not only epistemic but also ethical, in that "the value influence […] could in some cases be complicit in perpetuating certain kinds of power imbalances and injustices" (Parker and Winsberg 2018, p. 135). And yet, as we know (IPCC 2014, WGII), climate change has the greatest impacts on the most vulnerable countries and communities.

For these reasons, we could assign to the IPCC an ethical ideal of what I shall call "epistemic equality", namely to inform all the governments about the future consequences of climate change, both at a global scale and at the local scale that more particularly concerns them, as well as the options in terms of mitigation and adaptation, while giving equal consideration to their priorities and interests. This requires that the IPCC take sufficient account of the perspectives, preferences and interests of all governments in the production of its reports. Although such an ideal is not explicitly specified by the IPCC, there is nevertheless a worry that the reports, addressing global and local climate change impacts, may be biased against the preferences and interests of developing countries and are thereby inadequate for these countries.

Following the ideal of epistemic equality, acceptable values that are representative of the standpoints of all governments (or, more broadly, all communities) should be integrated into the process of producing climate expertise. A diversity of standpoints, including subaltern ones, should therefore be included so as to reflect all the relevant and legitimate interests of all peoples, to detect possible biases in the process and in this sense to strengthen objectivity.[10] This is why, I now want to argue, *strong objectivity* is the appropriate account of objectivity in the IPCC.

The idea of strong objectivity emerges from the framework of feminist standpoint theory (e.g., Intemann, 2010; Wylie 2003). Among other core assumptions the theory first of all incorporates the "situated knowledge thesis" according to which "knowledge is *for* and *by* a particular set of socially situated knowers and so is always *local*—a cultural/social/political 'location' characterized by the power relations endemic in such settings" (Crasnow et al. 2018). It is thus plausible to think that "the questions asked and the features of the world that are relevant to answering those questions vary depending on location" (*ibid*.) and on socio-economic background. The situated knowledge thesis ought also to apply to expertise, and here it highlights the problem considered above, namely that within the IPCC reports there is a possibility that the interests of the rich northern countries might prevail and therefore provide information that is articulated *for* and *by* them.

Importantly, feminist standpoint theory considers that a richer system of knowledge can derive from the consideration of a multiplicity of situated standpoints. And yet to take into account a multiplicity of standpoints, each of which comes with its own values, is precisely what the epistemic equality ideal encourages us to do. Usually, the feminist standpoint theory accords epistemic privilege to the subaltern standpoints of the marginalised groups over the dominant perspectives.

Those who are paid to teach and conduct research receive a disproportionate share of

[10] Decisions concerning which standpoints, knowledge, papers, etc. are relevant are to be made on a case-by-case basis, but depend partly on who are the stakeholders with respect to the subject matters.

> the benefits of that very nature and social order that they are trying to explain. Thinking from marginal lives leads one to question the adequacy of the conceptual frameworks that the natural and social sciences have designed to explain (for themselves) themselves and world around them. This is the sense in which marginal lives ground knowledge for standpoint approaches. (Harding 1992, p. 451)

Harding's concept of strong objectivity (Harding 1991, 1992) supports the integration of all relevant standpoints including subaltern ones. This matches the ideal of epistemic equality: there is no reason to give more importance to dominant groups, and all relevant standpoints should be included. As Harding emphasises, from a methodological point of view, objectivity benefits from reflexivity. Researchers are required to be explicit about their social locations and their possible interests and biases. In this way, one ought to be better equipped to escape the trap of confusing one's own partial perspective with a comprehensive view, and thus objectivity should be enhanced. Moreover, reflexivity is improved by the inclusion of marginalised groups into the process of inquiry (Anderson 2015). This is beneficial for epistemic reasons, since the marginalised are more likely to notice the biases of the dominant groups, but there are also good ethical reasons for this in that the inclusion of the marginalised is also conducive to greater social justice.

Finally, strong objectivity is an appropriate account of objectivity in the case of the IPCC in that it is reconcilable with the claim—made in this paper as well as elsewhere—that the IPCC's ARs are indeed value-laden. This approach to objectivity promotes the inclusion of a multiplicity of standpoints each carrying their own values, and it offers a theoretical and methodological framework in which the epistemic equality ideal can be thought and implemented in terms of specific procedures (even though, of course, it can never in practice be completely satisfied).

4. Applied strong objectivity

I have just given theoretical reasons why strong objectivity should be considered as an appropriate account of the objectivity that should, and to a certain extent already does, comprise the goal in the IPCC's production of expertise. That said, the idea of strong objectivity as being relevant in this context originally came to me while reading the IPCC's documents detailing its own methodological procedures. I now want to develop the reasons that I think lay behind my intuition here. In brief, it occurred to me that some objectivity-driven methodological procedures set by the IPCC precisely match the notion of strong objectivity (albeit in a non-consistent way), even though this approach to objectivity has not explicitly been adopted by the IPCC.

4.1. Declaration of conflicts of interest

An important step in ensuring objectivity within the IPCC is for the authors to declare conflicts of interest. The IPCC insists that the authors declare their respective conflicts of interest, and must avoid arousing public mistrust.

> The individual and the IPCC should not be placed in a situation that could lead a reasonable person to question, and perhaps discount or dismiss, the work of the IPCC simply because of the existence of a conflict of interest. (IPCC conflict of interest policy)

Revealing conflicts of interest is an important step not only for traditional views such as the "view from nowhere", but also for the strong view of objectivity. On the one hand, objectivity is conceived as an attitude whereby the researcher keeps her distance from the object of inquiry; on the other, conflicts of interests are certainly not permissible under the "strong view of objectivity", since they do not amount simply to having different perspectives or epistemic frameworks.

> A "conflict of interest" refers to any current professional, financial or other interest which could: i) significantly impair the individual's objectivity in carrying out his or her duties and responsibilities for the IPCC, or ii) create an unfair advantage for any person or

> organization. For the purposes of this policy, circumstances that could lead a reasonable person to question an individual's objectivity, or whether an unfair advantage has been created, constitute a potential conflict of interest. These potential conflicts are subject to disclosure. (*Ibid*.)

As specified in the introduction to this paper, the aim for objectivity in the IPCC may arise from its adaptive character. The IPCC has needed and still needs to revise its procedures regularly so to avoid internal and external criticisms. This may also explain the inconsistencies in the way objectivity is conceived and in which objectivity-driven procedures have been motivated and defined. Let me now identify those procedures that seem to me to present the best matches for strong objectivity.

4.2. Author team selection

Author team selection is an important component of the procedures whose overall requirements seem to meet the standards of strong objectivity. Let me explain why.

The IPCC report chapters are prepared by teams consisting of Coordinating Lead Authors, Lead Authors, Contributing Authors and Review Editors. Lead Authors write down pieces of the chapter, and Contributing Authors are occasionally invited to assist the former by providing specific expertise in their areas of specialisation. Coordinating Lead Authors have the responsibility to ensure that the chapter is consistent and exhaustive. The Review Editors check that the substantive comments of the reviewers are addressed by the author teams. They also make sure that the report reflects the diversity of perspectives in the literature, and assist Lead Authors with handling contentious and controversial topics. (IPCC Appendix A)

All these scientific actors are appointed by the Bureau of the relevant IPCC Working Group. They are nominated on the basis of their curriculum vitae, in and by their home countries, following a call for participation or because of their reputation and achievements. The selection criteria are set as follows:

- participation of experts encompassing the full range of scientific, technical and socio-economic views and expertise;
- appropriate geographical representation of experts from developing and developed countries and countries with economies in transition;
- balance of men and women,
- balance "between those experienced in working on IPCC reports and those new to the process, including younger scientists." (see IPCC Factsheet: How does the IPCC select its authors?)

In other words, the method of author team selection aims to ensure that a diversity of standpoints is taken into account. Again, "The composition of author teams aims to reflect a range of scientific, technical and socio-economic views and backgrounds" (*Ibid*.), and this is supposed to support a "Balanced assessment of the full range of scientific views, protected from the influence of special interests" (IPCC Factsheet: How does the IPCC select its authors?).

This intention of supporting a diversity of standpoints in a balanced fashion is made even more explicit via the management of "bias" as set out within the IPCC's Conflict of Interest Policy (IPCC conflict of interest policy). Unlike a conflict of interest, "bias" is defined as "a point of view or perspective that is strongly held regarding a particular issue or set of issues."

> In the case of author and review teams, bias can and should be managed through the selection of a balance of perspectives. For example, it is expected that IPCC author teams will include individuals with different perspectives and affiliations. Those involved in selecting authors will need to strive for an author team composition that reflects a balance of expertise and perspectives, such that IPCC products are comprehensive, objective, and neutral with respect to policy. In selecting these individuals, care must be taken to ensure that biases can be balanced where they exist. (*Ibid*.)

Elsewhere it is recommended that consensus should be reached when approving, adopting and accepting reports. That said, if consensus is judged not possible, the "differing views shall be explained and, upon request, recorded". This case boils down to issuing contradictory standpoints.

> Differing views on matters of a scientific, technical or socio-economic nature shall, as appropriate in the context, be represented in the scientific, technical or socio-economic document concerned. Differences of views on matters of policy or procedure shall, as appropriate in the context, be recorded in the Report of the Session. (IPCC Principles governing work, p. 2)

There is a specific note here regarding including standpoints from countries which, it is implied, are less likely to be heard: indeed, it is explicitly claimed that selection has "to ensure an appropriate representation of experts from developing and developed countries and countries with economies in transition" (IPCC Appendix A, p. 5). In the composition of a group "there should be at least one and normally two or more from developing countries". Typically, a chapter has a Coordinating Lead Author from a developed country, and a Coordinating Lead Author from a developing country, and between five and ten Lead Authors.

It thus seems that the IPCC has taken on board the importance of including a variety of standpoints (what it calls "perspectives"), especially when they are directly concerned with the issues addressed.

> The IPCC should make every effort to engage experts from the region on the author teams of chapters addressing specific regions, but should also engage experts from countries outside of the region when they can provide an essential contribution to the assessment. (*Ibid*. p. 6)

The reason for this is that, if a limited or narrow set of standpoints is represented, questions of importance may be overlooked. This worry goes some way towards meeting what I have called the epistemic equality ideal.

> A comprehensive assessment requires author teams to include a mix of authors from different regions and from developed and developing countries to ensure that reports are not biased towards the perspective of any one country or group of countries and that questions of importance to particular regions are not overlooked. (IPCC Factsheet: How does the IPCC select its authors?)

Of course, the participation of experts from developing countries and countries with economies in transition is conditional on the material and financial conditions offered to them. And here again the IPCC has anticipated the problem:

> [The] funding [of IPCC Workshops and Expert Meetings] should include full and complete provision for participation of experts from developing countries and countries with economies in transition. (IPCC Appendix A, p. 12)

The IPCC is aware of biases in the ARs due to exclusion of certain perspectives and has, it seems, taken steps to counteract this. That said, recent social science studies have shown that, within the IPCC, individuals often experience discrimination based on gender, race, class, sexuality, command of English, or even family responsibilities, or several of these social signifiers at the same time (Gay-Antaki and Liverman 2018). Further improvements certainly need to be made to ensure that all authors can properly contribute to the IPCC process, but this will not be discussed here.

4.3. Indigenous knowledge

Another important objectivity-driven factor, which also matches the requirements of strong

objectivity, is the recent inclusion of indigenous knowledge into the IPCC reports. This inclusion is made in the WGII, from the AR4. I assume that such inclusion would also lead to the integration of standpoints that are usually disregarded.[11]

Indigenous knowledge (local or traditional knowledge) is a source of information about, for example, Australia, Africa, the Pacific Islands or the Artic, and takes various forms including narratives. Such knowledge derives from historically accumulated experiences that are transmitted from generation to generation. Traditional ecological knowledge (TEK) is the subset of indigenous knowledge that deals with the sustainability of local resources. In anthropology this is sometimes defined as "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes 1999, p. 8). That said, it is important to keep in mind that traditional ecological knowledge considered as a quantifiable domain of knowledge about the environment and a field of study is itself a Western concept: "No indigenous person would classify their understanding of the world as TEK per se" (Smith and Sharp 2012).

In the production of IPCC reports it is expected that both indigenous and scientific knowledge systems can complement one another, and that such integration would be mutually beneficial. More precisely, the idea is that indigenous knowledge can inform science and strengthen the understanding of impacts. Indigenous knowledge can augment the available climate dataset in providing data about geographical areas that have as yet barely been observed (Smith and Sharp 2012). This knowledge can also help with developing adaptation strategies (Nakashima et al. 2012; IPCC 2014, p. 19), and because part of indigenous knowledge is about stewardship of land, water, and living resources, this knowledge can help with the implementation of sustainable land management practices (Alexander et al. 2011). Furthermore, "The treatment of indigenous issues in the IPCC is of particular interest because indigenous peoples have been identified as being uniquely sensitive to climate change impacts" (Ford et al. 2016). In turn it is assumed that the products of science would allow indigenous communities to make informed decisions about their current situations and future prospects for their own benefit, if they want to do so. "For example, in remote areas that do not have temperature data, indigenous knowledge narratives may be able to serve as proxy records. On the other hand, point data and remote-sensing measurements may aid in explaining phenomena that may be difficult to observe through tactile or visual means (e.g., ocean current strength and direction changes, ocean temperature, atmospheric oscillations)" (Alexander et al. 2011, p. 483).

However, the inclusion of such knowledge is in fact minimal (Smith and Sharp 2012 about AR4; Ford et al. 2016 about AR5), as the IPCC reports still mostly rely on peer-reviewed evidence, and indigenous observations of climate change are not often documented in peer-reviewed studies (Alexander et al. 2011). More generally, indigenous knowledge suffers from a perceived epistemological inferiority compared to Western science (Green and Raygorodetsky 2010); it is considered as less trustworthy as it is not based on scientific methods, and sometimes appeals to spiritual factors to explain biophysical phenomena (Cochran et al. 2013, p. 557; Smith and Sharp 2012).

There are also admitted difficulties inherent to the use of indigenous knowledge; indeed, given that they are different in nature, it is worth asking whether indigenous knowledge and scientific knowledge can be combined at all (see Ludwig 2016 for attempts at providing a model of integration). Indigenous knowledge systems are not uniform: "indigenous knowledges […] are as diverse as the communities and ecosystems from which they emerge" (Norton-Smith et al. 2016, p. 4). Orality is also sometimes said to limit the use of indigenous knowledge (Smith and Sharp 2012). Importantly, there is a difference of scale between climate science, which frames climate change as global and focuses on general circulation models, and indigenous knowledge that is situated, based on individuals' experience and observations, and concerns local conditions only (Ford et al. 2016).

[11] Wylie (2014, 2015) discusses the benefits of including indigenous knowledge in archaeology.

Another concern is ethical. The use of indigenous knowledge may not be considered respectful as it may be seen as an appropriation of data (Norton-Smith et al. 2016), ignoring its possible grounding in "generations of place-based observations and experiences" (Ford et al. 2016, 350); and its usage "may reflect the history of power relationships between indigenous groups and nonindigenous groups" (Alexander et al. 2011). That is why any attempt at integration entails certain responsibilities, such as securing the approval of the indigenous knowledge holders, protecting the knowledge from undesired industrial exploitation or misuse (see, e.g., Brewer and Kronk Warner 2015). Various solutions to the difficulties outlined here have been suggested: for example, Smith and Sharp (2012) propose a set of questions that authors must answer before using indigenous knowledge. Ford et al. (2016) insist that integration of indigenous knowledge in science needs to "acknowledge that both knowledge systems may differ and contradict each other in some circumstances. In such cases, both knowledge systems should not be pitted against each other to arrive at a 'correct' understanding, but viewed as providing diverse perspectives" (p. 351). They notably suggest that AR6 should promote greater involvement of indigenous scholars, and should incorporate alternative yet valuable information, outside the peer-reviewed literature, from "oral histories, traditional practices and grey literature" (p. 351). By bringing more and more relevant standpoints, these solutions would inevitably reinforce strong objectivity in the IPCC.

5. Concluding remarks

I have shown that non-epistemic values can intrude on the IPCC process at different levels: in climate modelling, in the assessment of literature, in the assignation of degrees of certainty, and in the assessment of risks and harming. I have assumed that this is not always a bad thing, and, even better, that a diversity of values is desirable for what I have called the "epistemic equality" ideal.

I then argued that strong objectivity provides an account of the kind of objectivity that ought to characterise the IPCC's process of expertise generation, and, as I have shown, already does characterise it to a certain extent. This kind of objectivity may be achieved through the inclusion of (paradoxically enough) *more* values in the models employed, and the pursuit of greater diversity among the authors selected and the literature cited.

Indeed, in looking in detail at the methodological procedures of the IPCC, it transpires that some of them already match the conditions of strong objectivity, which makes the account proposed in this paper particularly well-suited. Principles framed by a conception of objectivity, however, can be undermined when implemented in practice. More epistemological questions therefore require to be addressed. For example, what are the criteria for the trustworthiness of non-peer-reviewed literature and indigenous knowledge? Is there any information that the IPCC should take at face value? Further evaluative work needs to be carried out in order to conceive new concrete measures for the purpose of enhancing objectivity in the IPCC reports. Such work could be driven, for example, by the following empirical questions: which parts of the climate system do the climate models used in the IPCC reports actually represent, and are these models designed to answer the legitimate questions that all the governments need to address in their own policy-making? Are the authors from developing countries and economies in transition in an equal position to fully participate in the process of reviewing and assessing the state of knowledge in climate science? These questions remain open, and further investigation of the way strong objectivity can be implemented in the practice of the IPCC is needed.

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