In the light of equity and science: Scientific expertise and climate justice after Paris

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Abstract

The Paris Agreement is built on a tension between the common goal of limiting warming to 1.5 °C, and the differentiation that follows from the principle of equity. Scientific expertise is commonly seen as providing important means to overcome this tension, for example in the Agreement's "global stocktake", which is said to be undertaken "in the light of equity and the best available science". This raises the question of how scholarly communities best can contribute to deliberations on equitable differentiation in the effort required to meet common temperature goals. To discuss this question, the paper looks to the literature within Science and Technology Studies (STS) on the role of science in policymaking, where disagreement exists over the merits of "heating up" controversies through politicization, versus "cooling down" issues by seeking consensus. It assesses two cases in which scientific expertise has engaged with questions of equitable effort-sharing in international climate politics: The "Bali Box" of the IPCC's Fourth Assessment Report, and the "Civil Society Equity Review" undertaken prior to COP21 in Paris. Based on a comparison of the two cases, it is argued that scientific contributions should not shy away from highlighting conflicts in values and interests, and that "heating up" discussions about climate justice may be a valuable contribution to overcoming the tensions of the Paris Agreement.

Keywords

Paris Agreement; science/policy; climate justice; North/South equity; politicization/depoliticization

1. Introduction: Climate justice – important for whom?

Reading the introductory paragraphs of the landmark Paris Agreement of December 2015, a specific sentence on the Agreement's first page might give reason for pause. Among the broad statements about "the urgent threat of climate change" being a "common concern of humankind", the governments negotiating the Agreement also found reason to note "the importance *for some* of the concept of 'climate justice' " (UN 2015, emphasis added). This, of course, begs the question: For *whom* does justice matter in the global response to climate change? And, perhaps even more intriguing, as it was clearly not seen as important by all parties in the negotiations: For whom is justice apparently of no concern at all?

As this special issue on "Achieving 1.5˚C and Climate Justice" makes clear, the "concept of climate justice" can be defined in a number of ways (cf. Klinsky and Dowlatabadi 2009). In the multilateral climate change negotiations, justice has primarily been approached as a distributional question concerning how to equitably share the effort required to avoid dangerous climate change (Voigt and Ferreira 2016; Winkler et al., this issue). The Paris Agreement is frequently seen as a major turning point in the long-standing conflict over distributional justice in international climate politics, in that the obligations it establishes are applicable to *all* countries. The Agreement thus moves beyond the binary distinction between "Annex I" industrialized countries and "Non-Annex I" developing countries that has structured international climate politics since the adoption of the UN Framework Convention on Climate Change (UNFCCC) in 1992 (Rajamani 2016; Voigt and Ferreira 2016).

At the same time, the text of the Paris Agreement shows how the agreement seeks to balance two different aspects of climate governance in much the same way as the agreements of the 1990s: namely, that which is *common* – that is, what all countries need to do together – and that which is *differentiated* – that is, how the expected effort differs between countries according to some notion of justice. For example, in its Article 2, the Agreement first states the common goal of holding global temperature increase "well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels", and then goes on to state that the implementation of this common goal will "reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances" (UN 2015: 2; see also Gupta and Arts, this issue).

In other words, while the Agreement arguably moves away from the strong distinctions between clearly delineated groups of countries found in the UNFCCC and its Kyoto Protocol, it does not answer or render irrelevant the larger question of how to equitably share the climate change mitigation effort between individual countries (Rajamani 2016). On the contrary, it leaves the question of distributional justice wide open, by establishing the *common* temperature goal of 1.5 °C, and the *differentiated* goal of equity in climate change mitigation, as two parallel objectives at the core of the Agreement.

In dealing with the tension between the common and the differentiated, the Paris Agreement sets out an important role for scientific expertise. In Paris, governments invited the Intergovernmental Panel on Climate Change (IPCC) to deliver a special report on the newly adopted 1.5˚C temperature target, in order to inform future action. Even more importantly, the Agreement's main mechanism for assessing countries' differentiated contributions to the common temperature goals – the "global stocktake" that will be undertaken every five years –

is explicitly said to be carried out "in the light of equity and the best available science" (UN 2015: 12).

The fact that the Agreement explicitly draws on "the best available science" as input for the mechanism that will take stock of countries' progress towards its overarching objectives presents an important challenge to scholarly communities engaging with questions of climate governance. It may be read as an expectation that scientific expertise will be able to contribute to discussions about the relationship between the common and the differentiated in future negotiations – including the role of distributional justice in keeping global temperature rise below 1.5˚C.

However, just as the parties negotiating the Paris Agreement were split over "the importance for some" of justice in climate governance, recent debate suggests that a similar split exists in the climate governance research community. A commentary in *Global Environmental Change* (Klinsky et al. 2017) describes "an established line of argument", exemplified by remarks from renowned political scientist Robert Keohane, that holds that discussions of justice are "either irrelevant or dangerous in a post-Paris world" and therefore "ought to be left out of both academic work and policy discussions because they are conceptually flawed, could 'derail the negotiations', and erode political will". The authors of the commentary, however, take the opposite view, and argue that "analyses of equity and justice are essential for our ability to understand climate politics and contribute to concrete efforts to achieve adequate, fair and enduring climate action" (Klinsky et al. 2017). In other words: The discussion is just getting started about "the importance for some" – in this case for the climate governance research community – of "the concept of climate justice" following the adoption of the Paris Agreement.

This paper aims to contribute to the scholarly debate on the role of justice in climate governance research. It does so, however, not by arguing about justice-oriented research in the abstract, but rather by taking its cue from the decision-makers in Paris and the expectation that scientific expertise has something to contribute in their future discussions on countries' individual contributions to the global goals of the Paris Agreement. Starting from this expectation, the paper asks: How may scientific expertise contribute to achieving the Paris Agreement's parallel objectives of limiting temperature rise to 1.5˚C and equitably distributing responsibility for climate change mitigation?

In seeking to answer this question, the paper takes an empirical approach grounded in the field of Science and Technology Studies (STS). In STS, scientific work is commonly approached as a field of practice that can be empirically investigated on par with other social practices, such as politics. The implication is that the practice of scientific experts can be analysed without presupposing strong boundaries between e.g. different scientific disciplines, or between science and policy (cf. Gieryn 1999). Within the STS literature, however, scholars have prescribed diametrically opposing answers to the question of how scientific expertise may best contribute to policymaking, based on the competing strategies of "heating up" controversies through politicization, and "cooling down" issues by seeking consensus (Sundqvist 2014). In discussions of climate change in particular, this corresponds to the diverging views on whether politicization represents a problem or a solution when it comes to advancing climate action (Pepermans and Maeseele 2016).

This paper uses the analytical lens of "heating up" and "cooling down" to empirically assess two cases in which the scientific community has engaged with the contentious question of equitable burden-sharing between North and South in international climate politics. One is the case of the so-called "Bali Box", through which IPCC-affiliated scientists intervened in the discussion about North/South equity prior to COP 15 in Copenhagen, 2009. The other is the "Civil Society Equity Review", a joint initiative of scientific experts and broad segments of international civil society, which assessed the justice implications of government pledges leading up to COP 21 in Paris.

Based on a comparison of the two cases, it is argued that scientific involvement with questions of equity and climate justice in international climate governance should not shy away from highlighting conflicts in values and interests, rather than seeking to contribute to an illusory consensus. This argument has implications for the debate about the role of justice in climate governance research after Paris, in that it challenges the idea that focusing on justice could somehow undermine political will and ambition in climate policy. It also has implications for the IPCC and other research communities contributing to the "best available science" that should inform future stocktakes under the Paris Agreement.

2. Scientific expertise in climate governance

Scientific knowledge has played a key role in how climate change has been understood and acted on as a political issue. The development of an international climate change regime in the 1980s and 1990s was closely intertwined with the development of scientific institutions to assess the problem and produce usable knowledge for political decision-makers (Demeritt 2001). The IPCC is the prime example of how the relationship between science and policy has been ordered (Miller 2004). Through their comprehensive assessment reports, they summarize scientific knowledge with the aim of being "policy-relevant and yet policy-neutral, never policy-prescriptive".[1]

With the international policy process on climate change producing very limited results over the past three decades, however, the relationship between science and policy has increasingly come under scrutiny. Some social scientists have argued that the problem is "too little science", meaning that a lack of urgency in addressing climate change rests on a lack of knowledge, or dissemination of misinformation resulting in a poor understanding of the objective scientific knowledge on climate change[2] (Pepermans and Maeseele 2016: 479).

STS scholars have long criticized this so-called "deficit model" of scientific knowledge, arguing that "science never compels just one political outcome" (Pielke 2004: 406). Rather, the problem is seen as one of "too much science" – or, at least, of the existence of a "false expectation" (Collins and Pinch 1998: 154) that science can deliver definitive facts directly translatable into policy solutions (e.g. Sarewitz 2000). It is argued that the unreasonable faith being placed in the ability of science to guide policy "may engender profound alienation of ordinary human subjects around the globe from 'owning the issue' and thus from taking responsibility for it" (Wynne 2010: 291).

[1] Description of the IPCC organization available on the IPCC website, at http://www.ipcc.ch/organization/organization.shtml

[2] See, for example, «The Consensus Project»: http://www.theconsensusproject.com

Within STS, therefore, there is agreement that more reflexive approaches are needed, in which a strong divide between science and policy is not taken for granted. However, STS scholars still disagree on what the goal of such approaches should be: To settle issues by achieving a depoliticizing consensus, or the very opposite – to contribute to the politicization of issues by developing alternative framings and amplifying dissenting voices. Thus, while an STS scholar such as Roger A. Pielke Jr. argue for a more reflexive understanding of the role of science in policymaking, he still sees politicization as a potential "threat to the institutions of science and democracy" (Pielke 2004: 406) and something to be avoided. In this view, the goal is to "alleviate the tension between democracy and expertise" (Collins and Evans 2007: 140), for example, through "consensus conferences" (e.g. Joss and Durant 1995) that may produce uncontested governance outcomes.

Others draw the opposite conclusion, rejecting consensus as a necessary end-point and seeing controversies over technoscientific issues as "not confined to friendly discussions or by debates intended to conclude with an agreement" (Callon et al. 2009: 35). In its most radical form, this line of argument holds that as an inherently political endeavour, science should not shy away from being explicit about its politicizing character (Goeminne 2012). Rather, scientists should be actively contributing to moving from "matters of fact" to "matters of concern" (Latour 2004), participating in what Michel Callon calls "hybrid forums" that can give "visibility and audibility to emergent groups that lack official spokespersons" (Callon et al. 2009: 36). Politicization, in this view, is potentially constructive, and something to which scientific practice may well contribute.

This disagreement among STS scholars may be seen as "reflective of a larger split in the social sciences between problem-solving and critical theory", which Pepermans and Maeseele (2016) analyze as a disagreement over whether politicization is perceived as "problem or solution" in efforts to address climate change: While many social scientists highlight political polarization over climate change as a prime explanation for policy inaction (e.g. McCright and Dunlap 2011), others instead see a stifling consensus on climate change problematizations and solutions as symptomatic of a "post-political" condition that arrests political agency and suppresses radical alternatives (e.g. Swyngedouw 2010).

In approaching the above-mentioned disagreement within the STS literature, Sundqvist (2014) suggests analysing how different strategies for combining scientific and non-scientific participation in political conflicts contribute to either "heating up" or "cooling down" the controversy in question (cf. Callon 1998). His proposition is to investigate the specific practices adopted by STS scholars as they "invent, perform, and analyse participatory technologies in the context of controversial processes of scientific and technological decision-making" (Sundqvist 2014: 2069) with the aim of either "heating up" an issue through politicization, or "cooling down" the issue by seeking consensus.

The approach that Sundqvist takes to analysing the different strategies of STS scholars when engaging publics in debates over scientific expertise can of course equally well be applied to scholars within other disciplines, as an analytical tool for investigating empirically the practices through which various groups of experts seek to intervene in political controversies within their field of research. In a situation of profoundly divergent views on the relative merits of politicizing and depoliticizing strategies for scientific contributions to climate governance, such an empirically grounded approach may be fruitful for gaining a better

understanding of the actual effects of different strategies on political deliberation and decision-making.

In what follows, I employ the notions of "heating up" and "cooling down" as broad analytical categories for reviewing two cases of how scientific expertise has been put to work in real-world discussions on distributive justice in international climate governance. Unlike Sundqvist (2014), however, I will not limit my analysis to what he terms "participatory technologies". Instead I will explore more broadly how scientists become imbricated in political processes; their varying emphasis on participation from publics outside their own field of expertise; and how they seek to open up their field of inquiry to political debate, or, conversely, to close it down and seek consensus.

With an "intensely scientific primary framing" of the climate issue already built into most political institutions and processes (Wynne 2010: 291), it is perhaps not surprising that there have been numerous attempts to give scientific answers to questions of equity in international negotiations. Within the UNFCCC, equity has primarily been seen as an issue of achieving a fair sharing of the mitigation effort (or "burden-sharing") between the nation-states that are parties to the convention. Thus, climate justice has largely been understood in terms of distributional justice among countries (Winkler et al., this issue). A number of scientific disciplines have engaged with the questions arising from this framing. Scholars of philosophy, political science and economics have discussed various burden-sharing schemes for distributing the costs or responsibilities of mitigating climate change fairly between countries (e.g. Okereke 2010; Ringius et al. 2002). The strategies through which some of these scholars have sought to gain relevance in the political process, however, vary greatly.

In the following sections, two examples of such strategies are reviewed: First, the production of the so-called Bali Box, that sought to provide a quantified answer to the question of burden-sharing between North and South prior to COP 15 in Copenhagen; and second, the collaborative Civil Society Equity Review, that assessed the justice implications of government pledges leading up to COP 21 in Paris. The former case draws on an existing in-depth study of the Bali Box (Lahn and Sundqvist 2017); while the latter is based on interviews with participants in the Equity Review process, and documents published as part of that process (see also Holz, Kartha and Athanasiou, this issue).

3. The Bali Box: A scientific "fixed point"

During the negotiations starting at COP 13 in Bali, 2007, and leading up to COP 15 in Copenhagen, 2009, equitable burden-sharing between North and South was widely seen as the main obstacle to reaching agreement (Winkler et al. 2009). Countries had so far been separated by the UNFCCC "firewall" that placed different obligations on Annex I and Non-Annex I countries. In the negotiations that started in Bali, Northern countries sought to get rid of the firewall by increasing obligations on Non-Annex I countries, arguing that a new climate change agreement in Copenhagen should reflect the rapid changes that have taken place in large Non-Annex I countries over the last decades. Developing countries, on the other hand, argued that Annex I countries should continue to bear the main responsibility for climate change mitigation, pointing to their historical role in the atmospheric build-up of greenhouse gases. The developing countries' negotiating bloc G77, which dates back to the Non-Aligned

Movement and Southern anti-colonial struggles, connected the questions of climate change equity to larger questions of global inequalities and historical injustices (Roberts and Parks 2007).

In dealing with the decidedly "hot" issue of North/South burden-sharing leading up to COP 15 in Copenhagen, a specific fact box in the Fourth Assessment Report (AR4) of the IPCC came to play a leading role. In "Box 13.7", unassumingly placed on page 776 in the third volume of the AR4 report (Gupta et al. 2007: 776), scientific experts involved in the IPCC process attempt to translate the long-term global emission reductions required for reaching the 2°C target, into targets that are specified in time and space – that is, for the period up to 2020, and for Annex I and Non-Annex I countries as groups. The Box can be read as the IPCC's response to the question of burden sharing between the North and the South over the next ten years, providing a clear and quantified answer to these complex issues: by 2020, the North should reduce its emissions by 25–40% from 1990 levels, while the South should achieve a "substantial deviation from baseline".

At the Bali conference, a range of actors including the G77, the EU, and environmental NGOs, agreed that the numbers provided by Box 13.7 should serve as a foundation for the negotiations running up to COP 15. This placed Box 13.7 at the center of attention for the coming negotiations, and following the conference it became known as the "Bali Box". What united the diverse actors promoting the numbers of Box 13.7 was the understanding that "the *science-based* range [of Box 13.7] provides a *fixed point*", from which to derive commitments for individual Annex I countries (Winkler et al. 2009: 636, emphasis added). Thus, drawing on the scientific credibility of the IPCC, the numbers came to represent "what science says" that countries should do (cf. Shaw 2015). The historical and methodological origins of the numbers were neither understood nor perceived to be relevant by the actors promoting it. In effect, the Bali Box was treated as what Latour (1987) calls a "black box" – as a taken-for-granted container of apolitical facts (Lahn and Sundqvist 2017: 12).

Soon after the Bali conference, scientists at the Netherlands Environmental Assessment Agency and the European consultancy EcoFys – both involved in the IPCC AR4 report as authors – published a paper in which they identified themselves as the "authors of Box 13.7" (den Elzen and Höhne 2008). The paper described in more detail the approach taken to produce the Box, emphasising that its quantified burden-sharing between North and South was not based on choosing among the many existing approaches to equitable burden sharing. Rather, it was based on compiling an average range of emission reductions that would be expected from groups of countries under a wide range of different burden-sharing proposals in the existing literature – some of which were mutually excluding, and some of which were strongly opposed by countries in the UNFCCC negotiations. The paper also went beyond the content of the Box itself, further quantifying what a "substantial deviation from baseline" to be achieved by Non-Annex I countries would mean. It specified that these countries would need to reduce their emissions by 15-30% below their baseline emissions by 2020 (den Elzen and Höhne 2008). The numbers 15-30% were thus established as a corollary to the 25-40% emission reductions called for by Annex I countries.

The new numbers provided in the paper were quickly taken up by the EU, which was calling for quantified targets for developing countries in the negotiations on a new climate agreement. They were however not equally well received by other actors in the coalition who previously

had backed the Bali Box as a basis for the negotiations. In particular, several developing countries took a more critical stance, following an increased understanding of what the Box would mean for the mitigation efforts of Non-Annex I countries. Questions were being asked about the underlying methodology for calculating the burden-sharing implied by the Box, as well as the role of the scientists behind it (Lahn and Sundqvist 2017: 12–13).

When some developing countries went from endorsing the Bali Box to contesting whether its numbers could be trusted as an independent, scientific "fixed point", it follows the finding of Lahsen (2004) that developing country representatives are weary of IPCC scientists' claims to scientific objectivity potentially obscuring specifically Northern perspectives. In this case, the consequence of previous claims to scientific purity being called into question was that the Bali Box changed from being considered a black-boxed fact delivered by the impersonal IPCC to being associated with specific scientists and their specific methodologies. Attention was thereby drawn to its underlying assumptions and their political implications, leading to a politicization not only of the burden-sharing issue but also of the Box itself.

In producing the Bali Box, as well as their subsequent paper, the experts involved in authoring the IPCC report can be seen as seeking to bring about a consensus that would be able to gather as many actors as possible around a simple, quantified response to the contentious question of North/South burden-sharing. Through numerous presentations and reports on the subject, they were actively involved in representing the Bali Box as a ready-made scientific answer to what countries "need" to do (e.g. Höhne and Ellerman 2008). Thus, rather than opening up a discussion about the highly political issues underlying the burden-sharing question, the experts behind the Box sought to "cool down" the issue by appealing to the purity of scientific expertise: "Science says" that Annex I countries should reduce by 25-40% from 1990 levels, while Non-Annex I countries should reduce by 15-30% from their baseline emissions, by 2020.

This strategy initially seemed successful, in that it brought together a range of actors with varying underlying conceptions of justice to support a common quantification of equitable burden-sharing based on the understanding that this was what "science says". However, when the contents of the Bali Box were further unpacked, the Box changed character among some actors from an expression of "pure science" to being understood as "pure politics" (Lahn and Sundqvist 2017). Thus, although the Bali Box clearly had the effect on shaping the discussion on 2020 emission reduction targets, in particular in European countries, the cooling strategy eventually seem to have failed: Rather than helping to settle the conflict over North/South equity, it contributed to the conflict taking new forms – including a conflict over the scientific credibility of the IPCC's Bali Box itself.

4. The Equity Review: A tool for contestation

As the attempt to agree on an international climate change treaty at COP 15 in Copenhagen failed (due in large part to the conflict over burden-sharing between Annex I and Non-Annex I countries that the Bali Box had sought to overcome) a new round of UNFCCC negotiations was initiated to conclude a treaty by COP 21 in Paris, 2015. Relatively early in the negotiation process, it became clear that the resulting agreement in Paris would take a "bottom-up"

approach, relying on "nationally determined contributions" from each country rather than centrally negotiated targets and timetables (Voigt and Ferreira 2016).

The "bottom-up" approach had implications for the discussion of North/South equity in the negotiations. With the contributions of individual countries to be "nationally determined", deliberations on what would constitute a fair sharing of the efforts required to mitigate climate change was in effect relocated from the UNFCCC to national political processes. For actors wishing to maintain an explicit focus on distributive justice within the UNFCCC – in particular many developing countries and segments of civil society – this raised the question of how the equity implications of each country's contribution could be assessed and discussed, beyond the voluntary justifications offered by the countries themselves (Winkler et al., this issue).

This challenge was the basis for an initiative called the Civil Society Equity Review. It was initiated during COP 19 in Warsaw in 2013, by a broad range of civil society organizations – from traditional environmental NGOs like Friends of the Earth and WWF International to the trade union federation ITUC and a number of justice, development and faith-based groups. The main product of the initiative was a report that was launched prior to COP 21 in Paris (ActionAid et al. 2015), where the Intended Nationally Determined Contributions (INDCs) countries had put forward were reviewed and countries were classified as either "leaders" or "laggards" depending on whether their intended contribution fell within the band of what the report defined as each country's "fair share" of the mitigation effort.

The core idea that brought the initiative together was "that equity is not something that every country can decide for itself. It can be defined and quantified in a robust, rigorous, transparent and scientific manner" (ActionAid et al. 2015: 1). In this way, the initiative placed a strong emphasis on the contribution of science to discussions on equity. At the same time, however, the report highlighted that "a range of interpretations" of equity principles is possible (ActionAid et al. 2015: 1). The initiative's solution to this was to define, in great detail, the participating groups' own specific interpretation of what they took to be the broadly accepted principles of responsibility and capability, and to use this definition as a basis for quantifying "fair shares" of mitigation to expect from individual countries.[3]

To this end, the initiative entered into an agreement with experts from the Climate Equity Reference Project (CERP), a project bringing together scientists and policy experts from the Stockholm Environment Institute, the US-based think tank EcoEquity, and the University of Ottawa.[4] The CERP is a continuation of an existing collaboration around the development of the Greenhouse Development Rights framework (Baer et al. 2008), a normative proposal for equitable burden-sharing between countries in the climate change negotiations, and part of the body of literature that formed the basis for the numbers in the Bali Box (den Elzen and Höhne 2008: 259). For the Equity Review process, the CERP team became enrolled as technical experts using the modelling approach elaborated for the Greenhouse Development Rights framework, but replacing its more specific normative elements by parameters defined and negotiated by the civil society groups assisted by the CERP experts.

[3] The following section draws on interviews with participants in the Equity Review process, representing both civil society organisations and the CERP team. The main focus here is on the process of producing the Equity Review. For a detailed description of the methodology, see Holz, Kartha and Athanasiou (this issue).
[4] See https://climateequityreference.org/authors/

The organisations involved in the initiative conducted a series of meetings in which they and the CERP experts engaged in extensive discussions about how to operationalise the broad principles of responsibility and capability. The discussions made clear that groups held different views on questions such as the start year for determining countries' historical responsibility for climate change, and how to compare income levels among countries to determine their capability for mitigation action. The differences reflected long-standing disagreements over the role of justice in the strategy of the environmental movement (see Cassegård et al. 2017). Fundamental agreement on the more principled level however allowed for groups to come to agreement on an "equity band", setting out an upper and a lower level of what effort would be considered "fair". Based on this range, the CERP experts were able to quantify the expected contribution of different countries, and compare it to the INDCs submitted prior to COP 21.

The process resulted in a report signed by 15 international organizations, as well as more than a hundred national and regional organizations from all continents. The report is clearly not a product of "pure science": It is a judgement by a broad range of civil society groups, produced in close collaboration with scientific expertise, and quantified based on scientific modelling. It sets out in detail the specific choices that were made in operationalising the chosen equity principles (ActionAid et al. 2015: 9-10) – making it clear that the review is made on the basis of these choices, and that they therefore could have been different. However, the agreement among broad segments of civil society allowed for the report to be used to advocate for increased ambition by the countries singled out as "laggards".

In particular, the report's conclusions were picked up by a number of developing countries, with the chair of the G77 and a number of government representatives of large developing countries present at the launch of the report (SEI 2016: 23). These countries highlighted that most Northern countries' INDCs were deemed "unfair" while those of many developing countries were said to be "fair", using this as a basis to call for increased efforts from Northern countries and a stronger commitment to equity principles in the Paris Agreement. Government representatives of Northern countries, on the other side, were reluctant to engage with the findings of the Equity Review. According to interviews with actors involved in the Review, some government representatives privately criticized their findings for "letting developing countries off the hook". The Equity Review thus clearly contributed to politicizing the question of equitable burden-sharing leading up to Paris.

By bringing together a large number of civil society groups – including groups with traditionally very different approaches to questions of justice in climate politics – the experts involved in the Equity Review process can to a certain extent be seen as working towards establishing a consensus on how to operationalise justice principles, thereby "cooling down" the burden-sharing issue – at least among civil society actors. On the other hand, the end goal and apparent effect of the initiative was to politicize the analysis of countries' INDCs, by highlighting their (un)fairness in relation to a given set of justice principles, and thereby bringing voices of dissent and criticism to the fore in the reception of those contributions in Paris. Thus, the strategy underlying the Equity Review was decidedly one of "heating up" discussions on equity leading up to COP 21.

To what extend did this strategy have any impact on the negotiations? On a fundamental level, the impact was clearly limited, as no country ended up changing its pledged

contribution as a result of any political controversy or pressure to which the Equity Review might have contributed. On the other hand, civil society actors point to the report's clear message as important for reinforcing that justice remains a fundamental concern in efforts to address climate change, and thus increasing the leverage of developing countries in ensuring that this concern was duly reflected in the new agreement. Therefore, while a direct impact is difficult to discern, the initiative may have contributed to the Paris Agreement giving a greater explicit weight to equity considerations than many observers had expected (cf. Rajamani, 2016: 504).

5. Discussion: "Cooling down" or "heating up"?

Comparing the IPCC's Bali Box and the Civil Society Equity Review as two cases of scientific expertise contributing to political discussions about equity in climate change mitigation, important differences immediately stand out. Beyond what has been described above as diverging strategies of seeking to "cool down" and "heat up" the issue of equitable burden-sharing, the two cases differ in that the former builds on the institutionalized scientific credibility of the IPCC, with its strong historical connection to the UNFCCC process; while the latter is an explicitly political initiative serving to promote the agenda of a group of civil society organizations. On this basis, it might not be surprising that the direct influence on the negotiation process is far more discernible in the case of the Bali Box than in the case of the Equity Review. A simple way of explaining the different strategies taken and the varying degree of influence in the two cases, then, could be simply to conclude that the former is a case of scientific synthesis, while the latter is a case of political activism.

Setting out specifically to analyse the ways in which scientific expertise seek policy relevance, however, we are compelled to look beyond preconceived categories that label some actors or initiatives as "science" and others as "politics". Instead, we should be attentive to the actual practices of scientific experts engaging in different initiatives for bringing their expertise to bear on political processes, and analyse these practices symmetrically across institutional contexts.

From this perspective, it becomes clear that there is also a striking number of similarities between the two cases. Firstly, rather than being placed firmly on each side of a clear boundary between science and politics, both initiatives were fundamentally shaped by the political situation in which they sought to intervene. When the Bali Box was based on distributing emission reductions between Annex I and Non-Annex I countries, and between the years 2020 and 2050, this was not because of any special scientific significance attached to these years or political-geographical groupings, but rather because it was needed in order to make the numbers of the Box relevant to the UNFCCC negotiations (Lahn and Sundqvist 2017: 13). Similarly, the Civil Society Equity Review opted to present its results using the politically salient base year of 1990 as one of the benchmarks for determining historical contributions, even though this was seen by many actors participating in the initiative as not being consistent with the equity principles the review sought to apply.

Secondly, the scientific experts involved in both cases were directly taking part in efforts to bring their findings to bear on the policy process within the UNFCCC, including through presentations for policymakers and statements to media. In both cases this resulted in their

findings being used to support the positions of specific groups within the negotiations: The Bali Box was initially supported by a relatively broad coalition, and later primarily by European countries, while the Equity Review was taken up by the G77 as well as prominent Asian and African countries.

Thirdly, in both cases, their substantive contribution to the policy process was to suggest a scientifically quantified benchmark against which countries' emission reduction efforts could be assessed. Notably, both suggested benchmarks combined numeric *precision* with some level of *flexibility* – specific quantified amounts of expected mitigation, but with a "range" (the 25-40% and 15-30% ranges in the case of the Bali Box, and the "equity band" in the case of the Equity Review) that allows for a level of variation in application.

Recognizing these similarities, however, an important difference may be identified when it comes to precisely what the ranges in the two cases represent, and what this means for how the two initiatives were received. In the case of the Bali Box, the ranges provided by the Box itself and by the authors' subsequent paper (den Elzen and Höhne 2008) were used as a means of representing a variation in the existing literature on equitable burden-sharing. This is an integral element of the approach taken to produce the Box, i.e. to present an average across a number of varying and inconsistent ethical and political positions. Presenting an average range based on existing literature is what allows the Bali Box to present a clear and quantified answer without having to defend a specific ethical position or discuss the substance of the different burden-sharing proposals that underpin it. This, in turn, provides the basis for the Box being represented as "pure science", as what science says that countries "need" to do.

In the case of the Equity Review, on the other hand, the "equity band" presented in the report represents not an average across different positions, but a variation in the precise implementation of an internally coherent set of equity principles. The choice of specific principles is explicitly presented, allowing for a substantive discussion about their ethical basis as well as their technical implementation. This is also part of what places the Equity Review in the category of political intervention.

The difference in what the ranges signify provides an entry point for a refined understanding of the difference in the influence the two initiatives had on the negotiation process: It clarifies how the former case comes to rest on the idea of "pure science" and the institutionalized credibility of the IPCC, whereas the latter draws any influence it may leverage in the policy process from the political strength of the coalition of actors behind it.

Presenting an average range that avoided the need to discuss the validity of specific burden-sharing principles was key to the strategy of "cooling down" the issue, as it provided a quantified outcome that seemingly transcended existing political differences. The case suggests that this strategy initially was effective in building consensus among a broad group of actors. However, when disagreement eventually arose, the emerging consensus proved to be fragile. Moreover, as the initial agreement rested on an idea of "pure science" predicated on avoiding the need to argue a specific burden-sharing position, the disagreement became procedural – an argument over the scientific credibility of the Bali Box and its authors – rather than substantively engaging with the underlying political issues.

The Civil Society Equity Review, on the other hand, took disagreement as its starting point – evaluating existing INDCs against a set of clearly argued principles with the goal of "heating

up" discussions around their equity implications. This allowed for a substantive rather than procedural discussion about the underlying issues. The Equity Review had to face a different kind of challenge, however, as its institutional anchoring in civil society organisations allowed Northern countries to largely avoid the discussion by simply not responding to the critique offered by the Review.

6. Conclusion: Equity and science after Paris

Which of the two strategies reviewed above, then, offer scientific experts the best tools to contribute to achieving the Paris Agreement's overarching objectives along the two dimensions of the common and the differentiated – the 1.5˚C goal and the equity imperative? The strategy of "cooling down" promises to contribute to bridging divides and help establish the agreement that is needed to move forward in negotiations. The strategy of "heating up" offers the prospect of opening up debates that may shift the range of possible outcomes, albeit with highly uncertain results.

As the history of the Bali Box shows, however, the promise of achieving consensus by cooling down the issue of equitable burden-sharing may turn out to be difficult if not impossible to fulfill. It has been argued that articulating climate politics within the framing of "climate justice" is inherently antagonistic, as it draws attention to "the unequal social and environmental relations upon which neoliberal globalisation depends" (Chatterton, Featherstone and Routledge 2012). This is probably why some policymakers and scholars see questions of justice as a dangerous distraction that may "derail negotiations" (Klinsky et al. 2017) and are therefore best avoided – for example, by isolating it as a concern "for some", as in the introductory paragraphs of the Paris Agreement.

The case of the Bali Box, however, rather draws in the opposite direction. It illustrates how attempts to depoliticize equity issues can backfire, generating what Callon (1998) would term "overflow", and thus paradoxically "heating up" what was supposed to be "cooled down" (cf. Callon et al. 2009; Sundqvist 2014). In this way, the case points to international cooperation on climate change containing an *irreducibly political element* (Machin 2013; cf. Mouffe 2005) related to the question of equitable burden-sharing, which means that consensus-seeking strategies based on an idea of a purely scientific answer is likely to lead to disagreement taking new forms, rather than being permanently overcome.

Goeminne (2012: 6) argues that relying on science to achieve consensual decision-making obscures "the concernful work of composition that goes into the construction of a matter of fact (…) leaving policy nothing but externalities to be managed in a technocratic way." Drawing on the work of Mouffe (2005) he argues instead for seeing science as part of politics, conceived as a "struggle for who and what is to be taken into account". Such an approach would entail highlighting, rather than downplaying, conflicts and dissent. It would aim for agreements that are recognised as always partial and contingent, as an explicit choice among options rather than an outcome compelled by some notion of "pure science".

It follows from this that the more promising strategy for scientific experts to choose when engaging with questions of equity would be one that enables an informed conversation about political differences, and that purposefully generates political "heat" that may be leveraged to push for the higher level of ambition that the overarching goals of the Paris Agreement call

for. Such initiatives may take many forms, and they need not be left to civil society organisations. As already made clear in the Paris Agreement's call for its global stocktake process to be conducted "in the light of equity and the best available science", there is a need – and indeed an expectation – for scientific expertise, presumably including the IPCC, to contribute in this space. The implication of the argument put forward above is that such contributions should not shy away from highlighting conflicts in values and interests, nor from making explicit their own value judgements and normative commitments (cf. Pepermans and Maeseele 2016: 483).

This is not to say that politicization should always be understood instrumentally, as some some sort of universal answer to problems in climate policymaking. However, in the specific, "nationally determined" situation of post-Paris climate governance, "heating up" discussions about climate justice by clarifying the value choices and distributional implications of emission pathways may indeed be necessary in order to generate the political pressure that can build towards increased ambition over time. For scientific experts arguing over the importance of justice in climate change research, this means that shining a scientifically informed light on the irreducibly political issue of equity should be seen as a useful contribution to overcoming the potential tension between the common and the differentiated that lies at the core of the Paris Agreement.

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