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Perspective

Enhancing the contribution and role of practitioner knowledge in the Intergovernmental Panel on Climate Change (IPCC) Working Group (WG) II process: Insights from UK workshops

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ABSTRACT

This perspective critically assesses how the Intergovernmental Panel on Climate Change (IPCC) could facilitate a closer alignment of its activities and include lessons drawn from the policy and decision-making communities working on the ground at the regional/local levels. The objective is to facilitate practitioner input into the detailed choice of topics and priorities for IPCC review and in the conclusions drawn (we define practitioners as those engaged in the development and application of practical responses to climate change on the ground). By means of a series of workshops with academics, policy officials and decision-makers in the United Kingdom, the research reported here illuminates how the IPCC's Working Group II (WGII) has been used in the past to inform decision-making and how practitioner responses to climate change could better inform the IPCC process in the future. In particular, we recommend three key actions. Firstly that IPCC WGII should incorporate more practitioners as authors to improve the awareness and understanding amongst the writing teams of the nature and detail of decisions being made in response to climate change; secondly a practitioner-led IPCC Special Report should be commissioned on good-practice responses to climate change; and thirdly a new body should be created, attached to the IPCC, to synthesise and report on good practice on climate response strategies in a timely manner. By adopting these recommendations, the IPCC could become more directly useful to decision-makers working on adaptation at the national, regional and local levels and enable more actionable decision-making.

1. Introduction: A linear approach to science-based decision making

Despite the best efforts of international global change coordination bodies such as the World Climate Research Programme, the International Geosphere-Biosphere Programme and the International Human Dimensions Programme, the process by which knowledge on climate change is generated and disseminated is largely undirected. Individual scientists or groups of scientists select their topics of study and apply for funds, and, if successful, execute their research and publish their results in reports or the refereed literature. This research on occasion incorporates academic observation of practitioner work and as stated in Viner and Howarth (2014: 848): "a close look at the content, author lists and references shows that the 'adaptation' chapters [of the IPCC] lack practitioner experience, evidence and case studies that demonstrate how adaptation is being carried out on the ground. In other words, they provide an observational, top-down account rather than a practitioner-led evidence base." Here we define practitioners as those engaged in the development and application of practical solutions to climate change on the ground. Whilst acknowledging the social significance of the work of these individuals and bodies, the priorities of many global change scientists tend to focus on understanding the nature and functioning of coupled human-environment systems, and in making best estimates of their future trajectory. As a result, multiple interfaces are created between scientists, policymakers and practitioners that are generally ad hoc, often superficial, and function in the 'technocratic mode' (Rapley et al., 2014). This linear model in which science (facts) speaks truth

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to power (political realities, practicalities and values) (Jasanoff and Wynne, 1998) is still the dominant paradigm. Beck (2010) has shown that the Intergovernmental Panel on Climate Change's (IPCC) use of the linear model constrains the scientific and political debates about adaptation. A shift is needed to include bottom-up approaches, with the involvement of local and regional stakeholders and experts (Howarth and Painter, 2016). Whilst some academic research includes observation of practitioner's work (Ryghaug and Solli, 2012), Beck argues for an opening up of expertise in the IPCC process.

The Intergovernmental Panel on Climate Change (IPCC) is a body set up to "*assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation*" (IPCC, 2013). The IPCC's Working Group II (WGII) on Impacts, Adaptation and Vulnerability assesses the literature on the wide range of impacts and risks of climate change and identifies impediments and opportunities for responses. The IPCC conducts no research of its own. In its Principles for Governing IPCC work, the IPCC has a range of recommendations on the type of literature to be assessed as part of the review process for producing the Assessment Reports (AR). The use of non-academic evidence such as reports from government or industry, is encouraged, but with a clear emphasis on the need for transparency and caution in the type of literature drawn upon. Consequently it is apparent that non-academic evidence and expertise also has a place in the first and second review stages of the IPCC's Assessment Reports (IPCC, 1999). Despite this, and despite increasing efforts to improve the science–policy interface, the disconnect between science and practitioners remains a barrier to progress in climate change adaptation (Viner and Howarth, 2014).

The synthesis and interpretation of evidence from the scientific literature by IPCC authors is an exercise commissioned specifically to inform governments and the United Nations Framework Convention on Climate Change (UNFCCC). Climate change requires responses from across scales (international to local) and jurisdictions (public, private, third sector) to manage the challenge of its impacts. As such, the reports produced are not necessarily well-matched to the needs of the host of decision-makers and practitioners working on practical aspects of mitigation and adaptation in the public, private and third sectors. Whilst it is not the direct role of the IPCC to inform practitioner decisions the evidence assessments produced by the IPCC are widely used and required to be used in operational planning and policy delivery decisions that shape how society is responding to climate change. This presents both a challenge and an opportunity to the IPCC, and leaves room for the IPCC to usefully engage with this sector in developing its evidence.

2. Suggested enhancements to the IPCC

The structure and content of the IPCC reports are determined by the scientific community, with oversight and guidance from the national entities responsible for agreeing a collective international response, who are the prime audience for the scientific insights generated. Yet climate change requires action at multiple levels of governance in a multiplicity of spheres of human activity. A consequence of the approach taken has all too often been a mismatch between the information provided and the specific needs of decision makers tasked with formulating appropriate climate change related responses at the national, regional, local levels, particularly for adaptation (Viner and Howarth, 2014).

The IPCC has been scrutinised in recent years with scientific and political communities seeking to assess its future role. The InterAcademy Council was commissioned by the UN and IPCC to review the IPCC's process and procedures; it urged the IPCC to continue to adapt to the changing contexts to '*continue to serve society well in the future*' (InterAcademy Council, 2010) through a set of recommendations on its governance and management, its review process, communication and transparency in its assessment process. In addition, the UK's House of Commons Energy and Climate Change Committee led an inquiry into the IPCC's Fifth Assessment Working Group I report concluding "*the [IPCC] would benefit from increasing the level of transparency by recruiting a small team of non-climate scientists to serve the review process from start to finish*" (House of Commons Energy and Climate Change Committee, 2014).

Following the publication of the IPCC's Fifth Assessment report (AR5), the IPCC issued a request for views to inform its scope and process post AR5. The UK's Department for Energy and Climate Change as an example, consulted its devolved administrations, relevant departments, UK based review editors and Coordinating Lead authors (DECC, 2013) and suggested the IPCC address issues surrounding the complexity and volume of material that needed to be synthesised, adopt a more flexible approach to communication, consider the requirements of its end users and review its processes to ensure better transparency and inclusivity in the authors and experts participating. Whilst much feedback has been provided by wider stakeholder communities on how the IPCC could revise its processes and evolve to better suit the needs of its end users, suggestions from end users themselves have also been made. In February 2015, the IPCC assessed submissions on how it could review its future work, in particular related to the frequency and scheduling of reports, the structure and operations of the IPCC (notably to increase the number of members from developing countries in the IPCC Bureau from 31 to 34), making reports more user friendly, making the SPMs more useful, and enhancing the role of developing countries (IPCC Secretariat, 2015). Despite this, the content and form of the latest findings from the IPCC's WGII report are the consequence of a process which is highly academic and results from a synthesis of the scientific literature with long lag times (Jasanoff and Wynne, 1998). As a result there exist issues of focus, framing, language and priority, as well as significant communication challenges for decision-makers arising from mismatched languages and cultural interpretations. For example the practitioner community is increasingly framing its actions in terms of "resilience" instead of "climate change adaptation" (Sakai and Dessai, 2015).

Furthermore, a multilateral process such as the IPCC plenary (where decisions are made) is not conducive to illuminating 'good' decision-making and improvements of the organisation itself. There is therefore a risk that science conducted to feed into the IPCC process is addressing issues inadequately aligned with policy priorities and the needs of society, whilst not always using suitable approaches, and adopting unhelpful scientific jargon. There is also a tendency to concentrate on long-term trends whilst ignoring key and immediate decisions that confront practitioners and decision-makers (King et al., 2015). We propose that an approach that co-produces these reports across the three communities of academics, policy makers and practitioners, as defined above, could address these shortcomings and make the review process, especially of WGII more relevant to the decision makers, funders and deliverers of adaptation and resilience solutions.

3. Assessing the value of practitioner knowledge and expertise in the IPCC process

As we have noted, the gathering of evidence for the IPCC reports is an exercise conducted primarily by the scientific community,

albeit with a small number of practitioners involved in the IPCC as authors and possibly as review editors. Current practice in the IPCC does allow practitioners to be admitted into sessions with observer status as long as they are "*qualified in matters covered by the Intergovernmental Panel on Climate Change*" (IPCC, 2012, p1). However, the IPCC does not explicitly consider the extent to which its findings will be accessible to or utilised by practitioner communities or wider audiences. Hoesung Lee, the IPCC's new chair, has announced that it is his objective to better incorporate experts from developing countries and expertise from business and industry (Schiermeier and Tollefson, 2015). He aims to incorporate a stronger focus on solutions, providing more justification for the incorporation of practitioners relative to academics. This is further reflected in the appointment of the new co-chair of IPCC WGII, Debra Roberts, an experienced regional decision-maker in Durban's municipality.

A number of research programmes exist to address gaps in knowledge on adaptation to climate change that incorporate practitioner-based evidence. The UNFCCC Adaptation Committee, set up as part of the Cancun Adaptation Framework in 2010, has as its remit the promotion of enhanced action on adaptation (UNFCCC, 2011) and as part of this has set up the Nairobi Work Programme to address the "*knowledge needs arising from, inter alia, the Cancun Adaptation Framework*". The Work Programme also recognizes that its value and relevance will be enhanced by incorporating "*activities that build upon each other and are linked to issues that are practical and that engage adaptation practitioners*" (UNFCCC, 2013). PROVIA, the global Programme of Research on Climate Change Vulnerability, Impacts and Adaptation aims to respond to the challenge of providing relevant information to decision makers on adaptation and vulnerability to climate change by "*harmonizing, mobilizing and communicating the growing knowledge-base on VIA (Vulnerability, Impacts, Adaptation) to relevant audiences*" (UNEP, 2013a). Following consultation on the issue with scientists and experts, it has published a guidance document to assess impacts, vulnerabilities and adaptation to climate change (UNEP, 2013b) and has devised a set of Research Priorities for individual researchers and research institutions to align with the 'supply' of evidence from experts to align with the 'demand' set out by policy makers and decision makers. Its Scientific Committee consists of IPCC WGII Lead Authors thus providing a strong link back to the AR process in the IPCC. However the majority of these authors are academics with the limitations of this outlined earlier in this paper.

Another initiative is the Country Level Impacts of Climate Change (CLICC) which assesses the impacts of climate change at the national level. It is supported by UNEP and the UK Department of Energy and Climate Change, and works closely with PROVIA to inform decision makers. By July 2015, CLICC will have "*facilitated global understanding of country-level impacts to support action on climate change*" (HM Government/PROVIA, 2014) and provided recommendations on the establishment of a long-term strategy for sustainability. At the national level in the UK, the Climate Change Risk Assessment assesses current and future risks from climate change and works with experts, including practitioners, to review the evidence to inform its publication (CCC, 2014). In addition initiatives such as ICLEI, the C40 Programme Initiative, weADAPT and CLIMADAPT (Sanderson et al., 2015) and specific plans for cities such as the London Climate Change Partnership (LCCP) and the New York City Panel on Climate Change (NPCC) demonstrate how programmes at the national or city level are able to help meet emissions targets and deliver action. Unfortunately, these different approaches add further complexity to the coordination of climate policy and areas of synergy need to be identified to ensure efficiency of delivery and to enable lessons to be captured and shared (Hjerpe and Nasiritousi, 2015).

4. Methods

In order to explore in more detail some of the challenges outlined in this paper, three workshops were conducted in June 2015 in London, United Kingdom (UK) to address the extent to which the incorporation of practitioner-based evidence in the IPCC reports can enable better scientific advice for decision-making.

A total of 46 participants (Table 1) were recruited from three pre-defined categories: (i) academic, (ii) practitioner (directly involved in implementation of climate-related solutions or decision making processes on the ground) and (iii) policy communities (involved in formulating policies and decisions on climate change and nexus related issues). Participants were approached based on their knowledge, expertise and experience of decision-making on climate change, adaptation and resilience. These were identified using an assessment of the literature and of UK institutions and individuals in positions that fit one of the aforementioned categories, approached via the project contacts and networks. Participants were invited to one or more of the workshops with sufficient notice to maximise the chances of their availability, on occasions where specific invitees were unable to attend, they were asked to send a substitute from their organisation. Workshops were conducted over three consecutive days and addressed the following three questions:

1. How are the IPCC outputs used to inform decision making?
2. What is the role of practitioner-based evidence in the IPCC WGII process?
3. Can a process of co-production facilitate this process?

Each workshop adopted a semi-structured approach, with an approach piloted and refined beforehand. Workshops lasted half a day each. Participants were randomly split into two or three groups within each workshop, and discussions were recorded in written format with consent from all participants. The workshops where conducted under the Chatham House rule (where participants can use the information received but may not reveal the identity or the affiliation of the speaker) to encourage open constructive dialogue on the key themes discussed. Discussions were analysed using thematic analysis and were drafted as an internal document (Howarth and Viner, 2015) which was then shared with participants to review and comment on as part of the internal review process. This document was considered by workshop participants to be an accurate and representative account of the discussions held in the workshops, and assessment of these findings is presented and discussed below.

5. Results

Each workshop began with a rapid exercise to assess and discuss participant's use of IPCC outputs and challenges and opportunities they had experienced through this. Participants represented UK organisations such as SMEs, scientific organisations, non-governmental organisations, international consultancies, government departments, universities, private sector organisations, and the finance sector. The sample size (n = 46) and geographic

Table 1
Workshop participants.

	Academic	Practitioner	Policy
Workshop 1	3	6	5
Workshop 2	5	7	3
Workshop 3	7	6	4
Total	*15*	*19*	*12*

representation of the participants (i.e. United Kingdom) necessitates caveats with regards to the representation of our findings and suggest the need for further research with larger sample sizes and representation from different geographical and sectorial populations. Nevertheless, findings from these workshops provide valuable insights into how the IPCC WGII reports are used and perspectives on the role of practitioner evidence in their production.

Analysis of workshop discussions identified three overarching themes: (i) usage of IPCC WGII outputs in informing decision making, (ii) the role of practitioner evidence and expertise in the IPCC WGII process, and (iii) recommendations to the IPCC. Analysis and discussion of each theme is presented below and summarised in Tables 2–4.

5.1. Use of IPCC WGII outputs

A recurring issue throughout the workshop discussions was the relevance of the IPCC. When asked what they used the IPCC for, most participants stated that they predominantly used the Working Group I report on the science of climate change. They use a range of outputs including Assessment Reports, the Summary for Policy Makers (SPM) and press releases, as a reference point to ensure their work and decision-making is well grounded in academic rigour and in-line with the current scientific thinking.

> "*The IPCC is useful to anchor research. If you cite the IPCC, you pass the sniff test and your work will be considered credible*"
> [(Workshop 2, Group 3).]

This is in part due to what the IPCC represents: an international body created to assess the science of climate change and "provide rigorous and balanced scientific information to decision makers because of its scientific and intergovernmental nature". The quality of the science, as perceived by participants, is assured through its review process whereby hundreds of expert scientists who are chosen through a defined process volunteer their time to write the assessments as Coordinating Lead Authors and Lead Authors. The reports' peer review process also is highly regarded with recognition of the enormous task involving multiple rounds of drafting and review. As a result the IPCC has built a reputation – or a "*brand*" (Workshop 2, Group 2) as some participants described it – for ensuring their outputs are comprehensive and objective.

The IPCC outputs are valued in general, however in terms of WGII on Impacts, Adaptation and Vulnerability to climate change, not all participants find them useful for their own work. This in part is due to the focus of the science community in providing best estimates of future circumstances, whilst, as a result of scientific

Table 2
Alternative resources used by participants to inform their work on climate change.

Type of resource	Details
National data/sources	UK Climate Change Risk Assessment National Adaptation Plan Committee on Climate Change UK Climate projections (UKCP09) UK Met Office UK adaptation subcommittee reports UK National Risk Assessment Institute for Government
Government, agencies and legislation	Environment Agency and Climate Ready programme EU legislation (e.g. building regulations)
Networks and partnerships	ARCC Network of Research Climate Partnerships ICLEI RESNET: Resilient Electricity Networks for Great Britain Earth Island Institute Adaptation Network Infrastructure Operators' Adaptation Forum IOAF, supported by Environment Agency's Climate Ready
Academic evidence	Academic papers LWEC report cards (Marine (MCCIP), Water, Biodiversity, health, infrastructure)
International resources	New Climate Economy study World Bank reports Norwegian Meteorological Report for Impacts in Europe International Centre for Infrastructure Futures
Non academic evidence	Case studies Grey reports Cambridge Institute for Sustainability Leadership reports Own resources produced on local dimension of climate change, based on IPCC reports
Projects	IBuild (Infrastructure Business Models) Ibb and Dhamar Water and Sewerage Project Climate Adapt Infrastructure Transitions Research Consortium Changing Agricultural Research in a Changing World (CGIAR) RSSB 'Tomorrow's Railway and Climate Change Adaptation' T1009 Programme
Other	Recruit students Phone authors/scientists directly Commission research Invite IPCC authors to present at conferences

Table 3
Workshop responses to 'What is the value of incorporating practitioner based evidence in IPCC process?'

Refining their role	• Responsible for delivery of change and implementation of solutions locally as well as being involved in this process • Have an understanding of the challenges associated with local implementation • Can act at the interface between policy and academia • '*All those who are not doing research are practitioners*' (Workshop 1) • Not exclusive to sector or stakeholder type and may consist of different types of practitioners; for example, local government officials work closely with implementation on the ground and thus can also qualify as being practitioners
To end users	• Work at local level in design and implementation of climate adaptation approaches • Work closely with others locally and support them in their delivery • Understand context within which solutions are implemented and costs and benefits associated with this • Able to identify opportunities and blockages for climate adaptation approaches on the ground
To experts	• Provide invaluable relevant knowledge that would otherwise be overlooked if considered not academically sound • '*A practitioner articulates solutions*' (Workshop 1)
Producing evidence	• More up to date (as don't need to go through long academic peer review timescales) • Can provide up to date best practice and lessons learnt • Experience of responding to low frequency but high impact events (often not adequately covered in the IPCC reports) • Provide an opportunity to fill gaps left by academic evidence
Locality	• Ability to contextualise global climate change into the local context as well as providing local expertise to help frame international adaptation measures • Provision of local case studies of climate adaptation to feed into local decision-making • Practitioners can have a good understanding of cause and effect and mechanisms to ensure delivery of desired outcomes
Communication	• Enable IPCC reports to be more accessible to those delivering climate adaptation on the ground
Collaboration	• Encourage multiple stakeholder engagement in the design and implementation of climate adaptation

uncertainties, exploring less thoroughly the question "What is the worst that can happen?". Whilst the IPCC WG reports are known as the authoritative outputs on climate change, workshop participants recognised that they have been predominantly used to inform the international negotiations process, with a secondary use as a core knowledge base for wider audiences.

The results from WGII were found to be less precise than WGI, partly due to the condensing of the results of many thousands of climate change impact assessments into short review chapters, and partly because of the difficulty climate science has in providing reliable information at the regional and local scale. The chapters referring to adaptation provide a limited meaningful basis for use by practitioners, even those who work specifically in this area. They were discussed as serving merely as a review process and in essence attempting to describe real world approaches to adaptation in academic prose. At the local level in particular, WGII is sparsely used to inform decision makers on climate change with participants highlighting the wide range of alternative sources of evidence they use to inform their decision-making (Table 2). However, practitioner-based evidence was considered to add value to the IPCC WGII reports due to it being better aligned with end user needs, being more representative of practical implementation of adaptation on the ground and encouraging cross-sectorial and cross-stakeholder collaboration (Table 3). For example, an important evidence gap identified by participants is practitioner's experience of responding to low frequency, high impact events. These events, by the nature of probabilities, tend to occur within much shorter timescales, timescales more aligned with current practitioner decision making processes.

5.2. Utilising practitioner evidence and expertise in the IPCC reports

When considering the use of the IPCC WGII reports, practitioners, implementing action on the ground, highlighted the challenge related to the IPCC's outputs lacking the required specificity and scale of focus. In addition it was felt that there is a lack of suitable case studies from which lessons could be drawn. Many of the academic and policy-makers who attended the workshops, as well as the practitioners, felt that scale was an important limiting factor in determining the usefulness of the IPCC. Evidence of climate change impacts and vulnerability are especially useful for local planning, as such practitioners have need for local, specific data. However the broad body of scientific research drawn upon by the IPCC offers only limited information at this degree of granularity. Hence the focus on the regional levels in WGII, consequently the Assessment Reports and other outputs, reflect a more general picture which limits their usefulness for those implementing adaptation strategies at the local level and misses opportunities to understand how the effectiveness of adaptation measures is influenced in practice. When asked about alternative resources to fill these gaps, practitioners provided examples (Table 2), which included a wide range including the UK Climate Projections 2009, the UK Climate Impacts Programme, the UK National Adaptation Programme, World Bank Reports, UK adaptation sub-committee reports, UK Environment Agency's Climate Ready programme, the UK Climate Change Risk Assessment and the New Climate Economy report. Adaptation itself is a context-specific issue, and participants suggested the IPCC could make its WGII reports more useful in informing action against climate change by incorporating evidence from the local level, in addition to evidence from the national or international levels.

It was suggested that incorporating practitioners into the process could bring opportunities to address concerns about scale. For example, locality of evidence is salient for practitioners and actors working in the Global South where countries face a crisis of data and information regarding vulnerability to climate change is sparse (e.g. on demographics, geography and biodiversity), particularly in rural areas (Workshop 1, Group 3; Workshop 3, Group 2). It was agreed that practitioners, working at a local scale, are uniquely placed to provide the IPCC and its scientists with evidence regarding best practice at the local level, giving concrete examples and case studies where traditionally the IPCC has been unable to access such evidence.

> "*Practitioners are at the forefront of planning and implementing solutions therefore the case studies that arise from this are essential evidence of what works and what doesn't work at any scale (national, local, household, individual).*"
>
> [(Workshop 2, Group 2)]

Several practitioners claimed they did not use WGII at all, with one academic (having worked with practitioners) indicating he did not find WGII suitable for use by practitioners (Workshop 2, Group 3). As discussions evolved, practitioners who did use them, raised concerns about the usefulness of WGII specifically for them.

> "*I would never send the practitioners that I work with in adaptation to [consult] the IPCC [reports]*"
>
> [(Workshop 2, Group 3)]

When assessed in more detail this was the result of decision-makers finding the information lacking relevance to them and their work due to a significant gap in IPCC reports. Discussions revealed that participants recognise that the IPCC process is primarily an academic exercise to inform the UNFCCC, and that to be included in the report, data and evidence will have undergone an extensive academic peer review process designed to maintain the legitimacy of the science itself. Workshop discussions suggested that by excluding the evidence that does not go through the academic peer review process (such as some practitioner evidence), the IPCC is failing to capture a complete picture of the implementation and assessment of climate adaptation work on the ground. In particular one participant (Workshop 3, Group 2) explained how, in their experience of contributing to the IPCC reports, if something had not been covered in academic literature, and hence was not incorporated in the body of academic evidence assessed in the IPCC WG reports, then it, in effect, did not exist. This is a significant shortcoming as practitioners may have the knowledge and expertise to help provide a more complete and rounded assessment of climate change impacts, adaptation and vulnerability in a given location and relevant to a specific or multiple sectors.

The distinction in cultural contexts within which academics, decision makers and practitioners work was discussed at length and identified as a barrier to better alignment between each stakeholder's evidence base. Participants discussed the delivery of climate adaptation strategies for example which was seen to differ for practitioners and academics leading to a disconnect of methods used: the former is driven by the need for timely interventions (often less than a year) and sit within existing legal frameworks which may influence the specific nature of the interventions. In addition they often need to balance the competing demands of a number of stakeholders. On the other hand, academics tend to work on much longer timescales ranging from months to years, often driven by research agendas (which do not always align with policy agendas) and responding predominantly to the requirements agreed with their funders. In addition, practitioners based in commercial organisations (e.g. engineering, design and advisory companies) are limited by the need to provide a commercial justification for any engagement with research activities or reviews such as the IPCC. For example, practitioners in commercial consultancies taking part in the workshops explained how the majority of their work is fee earning, in many cases at least 80% utilization. Consequently, any work that is non-fee earning requires business development objectives (such as thought leadership, position and

profile), partnership development or research into new methods, techniques and materials.

5.3. Moving forward: Recommendations to the IPCC

The IPCC process, set up in the late 1980s was designed to provide authoritative and credible information to inform national level policy makers on climate mitigation and adaptation measures. The remit of the IPCC is to be policy-relevant without being policy-prescriptive, this remit however, and as discussed in this paper, needs to be set more effectively in the context: that the results of the review process are widely used by the practitioner community, even if this was not the original intention of the IPCC. Workshop discussions suggest that scientists' roles in the IPCC could evolve without jeopardising their academic credentials and requirements to remain policy neutral.

This Perspective does not seek to alter the IPCC's Terms of Reference, rather to build on its existing success at engaging with non-academic communities and utilising the resource expenditure to be of increased benefits to those delivering adaptation. The IPCC mechanisms however could be improved to be more inclusive of practitioner and grey evidence in innovative ways to maximise innovation and impactful action on climate change. Practitioner and decision maker's evidence for example identifies, assesses and overcomes numerous barriers that affect sustainable long-term decision making on climate change. This knowledge on overcoming or understanding these barriers is often a result of climate action in practice and therefore is an evidence base climate scientists could do more to engage with when producing the Assessment Reports. It is important to reiterate that non-academic stakeholders already play a part in the IPCC Working Group reports either as experts, co-chairs, authors and reviewers, however current limitations mean their input is limited (such as accessibility to practitioner evidence or data).

Building on existing processes adopted by the IPCC, an assessment of findings from this research leads us to suggest three alternative recommendations of differing levels of ambition to better incorporate practitioner based evidence in the IPCC process and achieve some of the benefits identified earlier:

- Recommendation 1: Incorporate more practitioners as WGII authors to gain a more balanced account of best practice alongside academic evidence as well as building experience on their specific information needs. This would build on existing processes where non-academics play an important role in shaping the content of certain chapters but would ensure this were to occur in more of the chapters, for example on urban areas [chapter 8], climate resilient pathways [chapter 20]. By working alongside practitioners to design their research aims and implement and complete research projects, they could simultaneously (i) engage in a cross-stakeholder skills and knowledge transfer on norms, cultures and practices as well as (ii) gain first-hand experience of what practitioner work entails and how this informs decision making and action on the ground. In parallel, practitioners would also gain a deeper understanding of academic rigour and practices and what the academic peer review process is. This would encourage them to consider developing an approach to practitioner peer review, for example by sending out reports to competitors, academics and other stakeholders in a transparent way to gain feedback and review through a practitioner-led peer review college. This practitioner peer review would not need to take significant amount of time and could be managed by a specific group set up for this purpose, modelled on the editorial team of academic journals. This would enable more practitioner reports to be considered for future Assessment Reports but would be a lighter touch process than recommendation 3 below.
- Recommendation 2: Commission a practitioner-led special report on good practice examples of implementation and evaluation of climate adaptation and resilience work on the ground. This could be the result of an IPCC Expert Meeting to help inform the Sixth Assessment Report, and would draw on the vast evidence base which exists, and predominantly unpublished in academic literature, which provides national and local accounts of climate action on the ground. This could also incorporate an analysis and comparison of approaches and methodologies with suggestions of possible transferability of practice to other geographic contexts. The latter analysis could incorporate both academics and non-academic audiences to provide space for academic rigour thus presenting minimal impact on existing IPCC processes.
- Recommendation 3: Establish a new body, attached to the IPCC similarly to the Taskforce on National Greenhouse Gas Inventories (IPCC, 2012), which synthesises practitioner evidence on climate adaptation and resilience. With transparency on motivations, methodologies and data (where appropriate and possible), this body would incorporate both academics and practitioners providing rigorous and regular (e.g. annual) assessments of best practice of climate adaptation globally, feeding in directly with the UNFCCC international process through which evidence of action could help shape future negotiations.

These recommendations present their own challenges, particularly where objectivity, purpose and legitimacy are concerned. At each of the workshops, discussions raised concerns of the impact that incorporating more practitioner-based evidence would have on the perceived legitimacy of the IPCC more generally (Table 4) – several questioned if it would be in danger of losing the academic rigour that gives it its current high level of credibility and legitimacy (Workshop 2). The reason for this could be that practitioner input may be tainted by hidden agendas and create conflicts of interests, such as commercial interests associated with some of

Table 4
Challenges with incorporating more practitioner evidence in the IPCC.

Legitimacy	• Challenging to assess validity and legitimacy of non-academically peer reviewed research • Could be seen as the promotion of hidden agendas by practitioners • Accountability and source of funding could influence purpose of practitioner evidence incorporated
Cultural differences	• Business case: sharing data and evidence with the IPCC needs to make business sense for practitioners • Practitioners have less time to dedicate to publishing
Lack of incentives	• Lack of motivation for practitioners to engage in the perceived long and tedious process particularly if there is no commercial incentive for them to do so • Terminology: language used by IPCC is not helpful for practitioners and policy makers at times not aligning with those used in practice
Adding complexity	• Adding additional evidence to include in the IPCC could complicate the process with added need to review and manage methodologies used • Could be too localised for IPCC purposes • Issues with identifying limits of evidence type that constitutes practitioner evidence at local level that is of relevance to international context • Practitioner evidence rarely undergoes academic peer review process
Maintaining IPCC's remit	• Incorporating into the IPCC's existing processes without undermining its rigour and robustness • Questionable how this fits with the IPCC's current remit to be 'policy relevant without being policy prescriptive'

the practitioners taking part in the process. This is currently addressed under the IPCC's Conflict of Interest (CoI) Policy (IPCC, 2011), whose purpose it is to "*protect the legitimacy, integrity, trust and credibility of the IPCC*" (p4). However increased input from non-academic contributors could enable a refinement and tightening of the CoI procedures to better reflect the evolving nature of the concerns raised and therefore benefit the process as a whole.

In addition, the risk of subjectivity in practitioner-based evidence in comparison to the academic peer review process was raised in the workshops. Whilst both practitioners and academics have their own rigorous processes, objectivity remains a concern. A remedy for this was through the recommendation that the IPCC produce a transparent and clear set of criteria for the practitioner-based evidence to follow, ensuring that high standards are maintained and, while not comparable, at least understood in both academic and practitioner evidence (Workshop 2). The details of how this would be designed, implemented and evaluated would need to be carefully co-constructed by the IPCC, scientists and non-academics and could either be a formal process (as described in recommendation 3) or a practitioner led editorial college which would form the basis for peer review for their reports.

Despite the concerns raised around the usefulness of the IPCC WGII report in terms of scale, the recommendations that emerged from workshop discussions were further explored by participants who argued that it was not within the IPCC's remit to focus on the local level (even though local case studies are used) and that instead the IPCC's role was to inform *national* decision makers (Workshop 1, Group 3). Several participants, particularly practitioners, also discussed how costly this could become potentially leading to an a "*bureaucratic nightmare*" (Workshop 1, Group 2) if IPCC scientists were required to work with practitioners for gathering, organising and synthesising data into an IPCC-approved format. A process of co-production however would present a viable solution to address this by inviting different experts with specialist knowledge to contribute in numerous ways earlier on in the process. It was felt, particularly by academics, that in order for co-production to adequately capture local scales, the process would require the participation of social scientists. These would provide expertise and insights into cultural impacts and implications for climate change, along with an understanding of the likelihood of people adopting different adaptation strategies. Therefore, by using a process of co-production (Viner and Howarth, 2014), in which all relevant stakeholders and disciplines are invited to share knowledge with one another, the IPCC would be able to benefit from existing knowledge.

6. Conclusions

This research has explored how the IPCC's processes can evolve to ensure it is fit for purpose to inform specific responses to climate change required to adapt to current and future challenges. The findings discussed in this paper have highlighted the value that the IPCC brings in informing the evidence base on climate change and the benefits of incorporating practitioner based evidence in the process.

Practitioners have both a local and global presence and work on a range of projects in all sectors across developed and developing nations. In addition, practitioners have experience of working with and delivering projects on adaptation within timescales better aligned with current decision-making processes (particularly in comparison with academic time scales).

By incorporating practitioner based evidence in the IPCC process, the produced outputs (e.g. Assessment Reports, Special Reports etc.) could more accurately reflect the evidence base on climate adaptation on the ground and simultaneously increase the use of these outputs by a broader audience. Article 7 of the UNFCCC Paris Agreement describes the need for "cooperation to enhance adaptation" and states that UN agencies (i.e. the IPCC) "support the efforts of Parties to implement the actions". This type of broader cooperation was alluded to by the new Chair of the IPCC, who indicated that there should be a more diverse range of contributors to the process.

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