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Integrating adaptation practice in assessments of climate change science: The case of IPCC Working Group II reports

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ABSTRACT

The delivery of effective climate adaptation on the ground requires that the (climate adaptation) practitioner community be better incorporated into the process of producing, gathering and synthesizing evidence on adaptation as part of the Intergovernmental Panel on Climate Change (IPCC) process. This is not a recent issue and the co-production of knowledge, that goes beyond the traditional realms of 'science speaks to power', can only fully inform adequate and robust adaptation if it incorporates more practitioners, end-users, and those working at the interface of science, policy and practice. Through a high-level analysis of authors of the IPCC's Working Group II reports and special reports of AR6, we explore the evolution of representation of practitioners in IPCC WGII author teams from AR5 to AR6 and we find that practitioner representation has increased in AR6, however this remains low. We discuss how this low representation can affect readership and the potential to inform climate adaptation practice. As the IPCC evolves and reflects on its own practices, we seek to inform this process by providing further reflection on how the IPCC outputs can continue to be policy-relevant and maintain neutrality while ensuring accesibility and usability by climate adaptation practitioners.

1. Introduction

In this Perspective, we reflect on the Intergovernmental Panel on Climate Change (IPCC)'s design, process and implementation of practices to incorporate climate adaptation practitioner expertise in the drafting of its Assessment Reports (ARs). The aim of the IPCC is to provide a robust, rigorous and up-to-date assessment of the science of climate change and its impacts to decision-makers, and in so doing to remain objective and transparent whilst providing policy-relevant material without being policy prescriptive (IPCC, 2016). The IPCC's Communication Strategy lists as its main audiences "governments and policy-makers at all levels, the UNFCCC (United Nations Framework Convention on Climate Change), and the UN-wide system intergovernmental processes more broadly". It also lists secondary audiences whose interests should be considered (e.g. "Broader audiences, such as IPCC observer organizations, the scientific community, the education sector, non-governmental organizations (NGOs), the business sector and the wider public", IPCC, 2016: 2–3) and third parties who may themselves produce accessible products based on IPCC outputs to share to their own audiences.

The first assessment report (AR1) of the IPCC was published in 1990, with AR2 in 1995 seen as a huge improvement as the process was better understood and the UNFCCC entered into force, placing greater emphasis on IPCC activities. The primary purpose of the reports is to support the UNFCCC negotiations on climate change. It is, however, becoming increasingly recognised that the reports would benefit from "widening aspects of the expertise to a more diverse and transdisciplinary range of actors [which] could improve the treatment of uncertainties, multi-scale interactions and the appropriation of expertise, as well as the integration of adaptation and mitigation policies" (Devès et al., 2017: 143). In being more inclusive, the IPCC would give greater legitimacy and influence to the knowledge it consolidates (Yamineva, 2017) and enhance essential support and evidence at a more national and localised level and in particular for the climate adaptation practitioner community, i.e., those delivering adaptation on the ground (Viner and Howarth, 2014).

The authorship of previous IPCC Assessment cycles has overwhelmingly been comprised of individuals from the academic and research community, at times leading to an over-emphasis of academic terminology and language. As a result, there have been increased calls to

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include voices from practitioners such as non-state and non-academic stakeholders to help temper the language, ensure the IPCC remains relevant (Livingston et al., 2018), facilitate cross-sector and cross-disciplinary dialogue and increase the legitimacy, credibility and salience of the process (Yamineva, 2017). This reflects the growing recognition of the benefits of including diverse perspectives, skills, objectives and interests of practitioners into the production of scientific knowledge (Howarth et al., 2022; Jasanoff, 2004; Bäckstrand, 2003) and its dissemination (Swart et al., 2017). The IPCC can be seen as successful in its attempts to diversify gender and developing country contributors (IPCC, 2020a; Gay-Antaki and Liverman, 2018; Berg and Lidskog, 2018), for example, the early reports were dominated by UK, US and EU-based scientists with a larger percentage of male authors, and since AR4, the IPCC has placed a greater emphasis on the diversity of its authorship. Nevertheless, Devès et al. (2017) highlight other key limitations of the IPCC process notably that the structure of the IPCC has not evolved with that of the context of expertise (e.g. that adaptation has been pushed up the agenda for UNFCCC negotiations); it lacks deep reflexivity on science-policy interactions; and it does not sufficiently integrate diverse expertise from across disciplines, actors and sectors.

2. Informing climate adaptation policy and practice audiences?

The UNFCCC process has been essential in driving forward the global commitments on climate change and the IPCC reports are crucial to providing a robust evidence base to support the intergovernmental negotiations and national policy responses. The IPCC process that produces the ARs is thorough and robust through an extensive and expert-led process of assessment and reviewing of most up-to-date published literature. In doing so, it produces probably the most comprehensive analysis and review that is undertaken in any scientific discipline (Stocker and Plattner, 2014) and avoids being policy-prescriptive. AR6 of the IPCC process culminated in the publication of the reports, once approved, in 2021 and 2022. This process has been longer and more complex than previous assessment cycles, further extended and complicated due to the impacts of COVID-19.

The primary audience of the reports is the intergovernmental policy community who comprise a mix of scientific and non-scientific experts, with a growing readership from national and local audiences (Howarth and Painter, 2016). The Summaries for Policymakers (SPMs) are aimed at policymakers and Synthesis reports, according to the IPCC's *Principles Governing IPCC Work* (IPCC, 2018), "should be written in a non-technical style suitable for policymakers and address a broad range of policy-relevant but policy-neutral questions approved by the Panel". Chapter authors are provided with formal and informal guidance on how to construct the reports, although a great deal is learnt on the job or passed down from those with previous IPCC experience. The informal *Handbook for Authors* provides information and background whilst more detailed documentation on key issues such as language on confidence, probability and risk is publicly available.

It is widely accepted that the target audience of the IPCC reports is *not* the academic community (other than providing updates and highlighting gaps in the state of the scientific evidence), but that they are very pertinent for policy and decision-makers from outside the intergovernmental community, extending into the commercial sector and local authorities (Howarth and Painter, 2016). Moreover, components of the reports, such as the Frequently Asked Questions, and SPMs are aimed at wider non-academic audiences. However, even if a large proportion of comments on the initial drafts of the ARs are *not* from the academic community, with the dominance of academics, they will be examined through an academic lens. Furthermore the low proportion of non-state and non-academic authors (such as public, private and non-profit practitioners) and little acknowledgement of how they have utilised the AR reports and deployed the adaptation solutions, further hampers the wider relevance of the reports. Indeed the lack of incorporation of diverse practitioner actors, expertise and perspectives in the IPCC process can affect the uptake of scientific evidence (Baker et al., 2020; Butler et al., 2020).

3. Representation of climate adaptation practitioners in AR6 IPCC WGII author teams

Previous research has critiqued the AR5 WGII report (Viner and Howarth, 2014) and explored how practitioner evidence could be better incorporated into future AR reports (Howarth et al., 2017). Building on this, here we present a high level analysis of author affiliations of the WGII chapters for AR5 (Table 1) and AR6 (Table 2) to explore the evolution of academic vs non-academic authorship of this WG's reports from the 2014 (AR5) to the 2021 (AR6) assessment cycles.

We use the term 'practitioner' to refer to "those engaged in the development and application of practical solutions to climate change on the ground" (Howarth et al., 2017: 4) acknowledging that they play an important role in "shaping and guiding policy on the ground" (Viner and Howarth, 2014). Climate adaptation practitioners, which we focus on in this Perspective, exist in the private, public and non-profit sectors. Practitioners can play an important role in enabling the content of the ARs to become usable knowledge (Haas, 2004), addressing concerns about the implications of scientific evidence for climate action (Victor, 2015) which can jeopardise consensus which underpins the credibility of the ARs (Pearce et al., 2018; Beck and Mahony, 2018).

Comparing both Tables, we observe that AR6 has increased the number of practitioners by two, to 41 (12 CLA, 25 LA, 4 RE) compared to AR5 which had 39 in total (5 CLA, 26 LA, 8 RE). While the number of LAs has remained almost the same, we see a doubling of practitioners as CLAs for AR6, compared to AR5 but a halving of practitioners as REs. This is encouraging considering the CLAs have a coordinating role across a whole chapter rather than contributing to a specific section, and thus can have greater peripheral vision as to the content and language of the chapter. It is however disappointing to see the drop in practitioners in AR6 as REs for WGII chapters, considering they "ensure that all substantive comments received during review are given appropriate consideration by the author teams and ensure that genuine diversity in perspectives in the literature is reflected adequately in the report" (IPCC, 2019).

For the purpose of this Perspective we reflect in more detail on the chapter analysis of AR6 (Table 2) which shows that many of the authors are from the research/academic community and that less than a fifth of CLAs, LAs or REs in the WGII drafting process can be classified as climate adaptation practitioners, according to our definition. Just over a quarter (25.5%) of CLAs are practitioners with the majority of chapters having at least one practitioner as a CLA, with the exception of Chapters 7, 9, 11, 12, 13,14, and only four of the eighteen chapters have a practitioner as a review editor. Whilst it is not the purpose of this Perspective to comment on what would constitute a good or balanced number of practitioners on the author teams, we do however consider that having *at least one* practitioner as CLA, LA or RE for each chapter would provide a strong opoprtunity and avenue through which practitoners can have greater input in the content of the reports to better allign with practitioner needs and evidence on the ground. In the case of AR6, and encouragingly, the Co-Chair of WGII is a local government representative, meaning that 50% of the highest positions in the IPCC report process is held by a practitioner, a situation which could be better replicated at the chapter level.

The majority of continent/country-focused chapters in AR6 do not have a practitioner as a CLA and Chapters 11 (Australasia) and 14 (North America) have no practitioner within the author or review team whatsoever. In addition, none of the chapters have practitioner authors from Local Governments and Municipal Associations (primary target groups according to the IPCC communication strategy) and there is an obvious lack of city-wide expertise represented. It is arguable that having practitioners as CLAs provides an oversight into the chapter drafting that could better reflect practitioner needs and insights. However, the low

Table 1
Analysis of practitioners as authors in AR5 WGII chapters. Where an author had more than one affiliation and one of these was non-academic, then these were classified as 'practitioner'. * denotes government, * * denotes private sector.

Chapter	Number of Coordinating Lead Authors (CLA) who are practitioners	Number of Lead Authors (LA) who are practitioners	Number of Review Editors (RE) practitioners	Total number of practitioners in author team
1: Point of departure and key concepts	0 of 2	1 of 6 (Helvetas Swiss Intercoop. India)	0 of 2	1 of 10 (10%)
2: Foundations for decision making	0 of 2	1 of 6 (RAND)	1 of 2 (Consultant)	2 of 10 (20%)
3: Freshwater resources	0 of 2	0 of 6	0 of 1	0 of 9 (0%)
4: Terrestrial and inland water systems	0 of 2	0 of 6	0 of 3	0 of 11 (0%)
5: Coastal systems and low-lying areas	0 of 2	1 of 7 (Global Climate Forum)	0 of 1	1 of 10 (10%)
6: Ocean systems	0 of 2	0 of 6	0 of 2	0 of 10 (0%)
7: Food security and food production systems	0 of 2	0 of 5	0 of 2	0 of 9 (0%)
8: Urban areas	1 of 2 (IIED)	1 of 5 (eThekwini Municipality*)	0 of 2	2 of 9 (22.2%)
9: Rural areas	0 of 2	3 of 6 (IIED, IFAD, Kulima)	0 of 2	3 of 10 (33.3%)
10: Key economic sectors and services	0 of 2	1 of 7 (Munich Reinsurance Company)	2 of 2 (Ministry of Env & En; ExxonMobil Research & Eng Company)	3 of 11 (27.3%)
11: Human health: impacts, adaptation and co-benefits	0 of 2	2 of 6 (WHO; China CDC)	0 of 2	2 of 10 (20%)
12: Human security	0 of 2	0 of 6	0 of 2	0 of 10 (0%)
13: Livelihoods and poverty	0 of 3	1 of 4 (IEDA)	0 of 1	1 of 8 (12.5%)
14: Adaptation needs and options	1 of 2 (IIED/IC CCAD)	2 of 6 (African Development Bank)	0 of 2	3 of 10 (20%)
15: Adaptation planning and implementation	0 of 2	0 of 5	1 of 2 (IDB)	1 of 9 (11.1%)
16: Adaptation opportunities, constraints, and limits	1 of 3 (RAND)	2 of 3 (Rand; UNEP)	1 of 2 (World Bank)	4 of 8 (50%)
17: Economics of adaptation	1 of 2 (UNDP)	2 of 5 (World Bank; Ouranos)	0 of 3	3 of 10 (33.3%)
18: Detection and attribution of observed impacts	0 of 2	1 of 5 (National Panel Of Technical Experts - Climate Change Commission)	0 of 3	1 of 10 (10%)
19: Emergent risks and key vulnerabilities	0 of 3	1 of 4 (US Centre for Disease Control)	0 of 2	1 of 9 (11.1%)
20: Climate-resilient pathways: adaptation, mitigation and sustainable development	0 of 2	1 of 7 (IIED)	0 of 3	1 of 12 (8.3%)
21: Regional context	0 of 2	1 of 7 (Red Cross Red Crescent Climate Centre)	1 of 2 (GCAP)	2 of 11 (18.2%)
22: Africa	0 of 2	2 of 5 (START; Independent specialist)	0 of 2	2 of 9 (22.2%)
23: Europe	0 of 2	0 of 6	0 of 2	0 of 10 (0%)
24: Asia	0 of 3	1 of 6 (National Panel Of Technical Experts - Climate Change Commission)	1 of 2 (National Panel Of Technical Experts - Climate Change Commission)	2 of 11 (18.2%)
25: Australasia	0	1 of 6 (Climate risk consultant)	0 of 2	1 of 8 (12.5%)
26: North America	1 of 2 (Stratus Consulting)	0 of 6	0 of 2	1 of 10 (10%)
27: Central and South America	0 of 2	0 of 6	0 of 2	0 of 10
28: Polar regions	0 of 2	0 of 6	0 of 2	0 of 10
29: Small islands	0 of 2	1 of 5 (SPREP)	0 of 2	1 of 9 (11.1%)
30: The Ocean	0 of 2	0 of 4	1 of 2 (Env & Fisheries Dept)	1 of 8 (12.5%)
Total	**5 of 64 (7.8%)**	**26 of 178 (14.6%)**	**8 of 61 (13.1%)**	**39 of 303 (12.8%)**

Source:Adapted from IPCC (2020b).

proportion and particularly lack of (in some cases) climate adaptation practitioners as authors in a large number of these chapters that could ultimately be used to inform climate adaptation practice across scales, presents a gap in informing delivery of climate adaptation.

Our analysis is particularly pertinent considering calls by Livingston et al. (2018) for the IPCC to consider carefully its relevance in the polycentric policy landscape which "requires a more detailed engagement with the multiple realities of climate change as they unfold across the world" (89). Nevertheless, it is important to consider limitations and challenges to the inclusion of practitioner perspectives and expertise in the IPCC process. Notably that due to the nature of practitioner work, (i) there may be a drive towards short-term, client-led project delivery at the expense of academic rigour in methodological approach, design and delivery (however this is offset by rigorous internal review processes by practitioners that are required to reduce liability); (ii) practitioners are often led by client requirements when delivering projects which may not be entirely value- or politically-neutral, and (iii) whilst many solution-based practitioner projects can appear as having a narrow focus, these are often set in the wider robust technical and scientific frameworks established to ensure consistency and robustness. However, with this in mind, the value of incorporating practitioners in processes such as the production of IPCC assessment reports cannot be underestimated, particularly as these assessments engage more in co-production approaches enabling " a better understanding of how evidence is perceived, used and co-produced across scales to inform climate action; [providing] clarity on the range of responsibilities held by different climate action 'stakeholders', and [enabling] more efficient consideration of different stakeholder expertise and knowledge on climate action within different contexts." (Howarth et al., 2022: 9).

We acknowledge that the analysis presented in this Perspective is limited, nevertheless insights from this provide a useful contribution to the broader disucssion as to how and where practitioners could be more integrated in the IPCC AR drafting process. Other areas to investigate to build on this would be to analyse (i) the proportion of practitioners that were submitted by governments for consideration for selection of authors, (ii) what proportion of applications to governments were by

Table 2
Analysis of practitioners as authors in AR6 WGII chapters. Where an author had more than one affiliation and one of these was non-academic, then these were classified as 'practitioner'. * denotes government, * * denotes private sector.

Chapter	Number of Coordinating Lead Authors (CLA) who are practitioners	Number of Lead Authors (LA) who are practitioners	Number of Review Editors (RE) practitioners	Total number of practitioners in author team
1: Point of departure and key concepts	1 of 2 (RAND)	0 of 10	0 of 2	1 of 14 (7.1%)
2: Terrestrial and freshwater ecosystems and their services	1 of 3 (Natural England)	0 of 9	0 of 3	1 of 15 (6.6%)
3: Ocean and coastal ecosystems and their services	1 of 2 (Ocean Conservancy)	1 of 11 (Department of Agriculture, Forestry & Fisheries*)	0 of 2	2 of 15 (6.6%)
4: Water	1 of 2 (ICIMOD)	4 of 10 (Centre for Policy Dialogue; Climate Analytics; I-Catalist, SL; Climate Action Network)	0 of 2	5 of 14 (35.7%)
5: Food, fibre, and other ecosystem products	1 of 3 (National Panel Of Technical Experts - Climate Change Commission)	2 of 10 (Fisheries and Oceans; UNEP DTU Partnership)	1 of 2 (Climate Research for Development (CR4D))	4 of 15 (26.7%)
6: Cities, settlements and key infrastructure	1 of 3 (IIED)	0 of 9	0 of 2	1 of 14 (7.1%)
7: Health, wellbeing and the changing structure of communities	0 of 2	2 of 11 (Chinese Centre for Disease Control and Prevention; European Centre for Disease Prevention and Control; WHO)	0 of 3	2 of 16 (12.5%)
8: Poverty, livelihoods and sustainable development	1 of 3 (Indian Council of Forestry Research & Education)	0 of 7	1 of 3 (DNA-Ministry of Energy, Industry and Mineral resources)	2 of 13 (15.4%)
9: Africa	0 of 3	1 of 10 (Ethiopian Public Health Institute)	0 of 2	1 of 15 (6.6%)
10: Asia	1 of 3 (National Disaster Management Institute)	1 of 11 (Japan Meteorological Business Support Center)	0 of 2	2 of 16 (12.5%)
11: Australasia	0 of 2	0 of 10	0 of 2	0 of 14 (0%)
12: Central and South America	0 of 2	1 of 12 (Foro Ciudades Para La Vida)	0 of 2	1 of 16 (6.25%)
13: Europe	0 of 3	3 of 13 (BRGM - French Geological Survey; WWF Russia; Snowchange Cooperative)	0 of 2	3 of 18 (16.6%)
14: North America	0 of 3	0 of 10	0 of 2	0 of 15
15: Small islands	1 of 2 (Pacific Centre for Environment and Sustainable Development)	2 of 8 (Climate Change and Biodiversity Consultant; Red Cross Red Crescent Climate Centre)	1 of 2 (Maldivian Coral Reef Society)	4 of 12 (33.3%)
16: Key risks across sectors and regions	1 of 3 (Red Cross Red Crescent Climate Centre)	1 of 9 (Climate Analytics)	0 of 2	2 of 14 (14.3%)
17: Decision -making options for managing risk	1 of 3 (Green Investment Group**)	2 of 9 (Red Cross Red Crescent Climate Centre; Mountain Research Initiative)	1 of 2 (Food and Agriculture Organization of the United Nations)	4 of 14 (28.6%)
18: Climate resilient development pathways	1 of 3 (RAND Corporation)	5 of 11 (Helvetas Swiss Inter -cooperation: Switzerland; Latinoamérica Renovable; Housing Company of Rio de Janeiro State; Electric Power Research Institute; National Panel Of Technical Experts - Climate Change Commission)	0 of 2	6 of 16 (37.5%)
Total	**12 of 47 (25.5%)**	**25 of 180 (13.9%)**	**4 of 39 (10.2%)**	**41 of 266 (15%)**

Source:Adapted from IPCC (2020c).

practitioners, to determine if there is any active bias in selection, as opposed to practitioners not putting themselves forward for this role, and (iii) to compare chapters with/without practitioners to see if there is discernible difference in content and presentation.

4. Conclusion

Adaptation practice involves participation of a diverse set of actors in the design, development, implementation and assessment of adaptation and resilience strategies. When it comes to the knowledge and expertise gathered from the implementation of these practices, adaptation practitioners are at the forefront of this and hence their knowledge proves invaluable to informing global efforts and evidence assessments on best practice and ways to avoid maladaptation. The IPCC authorship is diverse and extends across many disciplines. In this Perspective, we have analysed the extent to which practitoners directly contribute to the IPCC WGII report of AR6 and have found that practitioner representation in WGII chapters is only 15%. AR6 compared to AR5 has increased the number of practitioners slightly (12.8% in AR5) in the chapter author teams however with a drop as RE but an increase as CLAs, with implications for inclusiveness of expertise and skills of those working on the ground to implement and deliver climate adaptation.

The IPCC is regarded as one of the most authoritative sources on climate change, and over its six assessment cycles has gradually improved how it communicates its outputs. However, a focus on practitioners as both end-users and contributors has stagnated, affecting both the relevance of the content of the WGs, especially WGII, and their takeup and usability by non-academic and non-policy audiences. We have argued that increased participation of practitioners can help improve reflection on different perspectives. To maximise the impact the IPCC outputs have in informing climate-related decision-making by end-users, strengthening practitioner involvement in the IPCC as CLAs, LAs, REs, (and Contributing Authors) would further enhance the credibility, legitimacy, salience and influence of AR outputs, and particularly as CLAs. Giving more prominence to this in the IPCC's drive to be more inclusive in its authorship teams (for example, by including at least one practitioner in each team), will ensure more inclusivity and integration of practitioners as authors. In so doing, and with a recognition of the challenges that may arise, this will contribute to a richer, more diverse and representative expertise driving the production of WGII reports, to inform climate adaptation practice.

Authors' contributions

CH led the author analysis, DV led the reflection on IPCC process. Both authors contributed to the drafting of the perspective.

Consent to Participate

No consent was required.

Consent to Publish

Consent to publish.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Availability of data and material

Data is freely available via the Intergovernmental Panel on Climate Change portal.

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Conflicts of interest/Competing interests

The authors declare no competing interests.

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