

IPCC Working Group I Sixth Assessment Report Authors' Survey

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Key messages from the WGI AR6 authors' survey

Report structure and scope

A greater focus on integration, across WGI topics, chapters and Working Groups, was appreciated by authors, making the report more robust, policy-relevant and user-orientated.

- **Over 80% of responses thought the structure of the report was well suited for the AR6 assessment.** The drawbacks to this structure were that much more coordination was needed and the locations for some topics were hard to place or missed/overlooked. Overall, the strengths out-weighed the weaknesses.
- **Overall, having established mechanisms helped to further integrated assessments.** Dedicated teams (including other WG authors where relevant) that were established early in the process and had clear objectives but also who had identified leads/facilitators to run and drive discussions in an inclusive manner (often with support or guidance from the Bureau and/or TSU) led to a more integrated assessment. Having dedicated spaces for such assessments also enabled a robust process.
- **Authors were divided on how the WGI should evolve in AR7**, with almost half of responses preferring WGI AR7 to have a similar level of integration as the AR6 and a third of responses preferring an even more integrated structure.
- **Identified policy-relevant topics relating to WGI for AR7 were interconnected topics with the other working groups** such as links to risks, impacts, net-zero, and mitigation monitoring. Increasing regional focus, further evaluation of scenario projections, attributing extremes, and further understanding tipping points also were listed many times as topics of focus.
- **Overall, authors preferred for the next WGI assessment to be released with enough time for the next CMIP to be established, to allow the scientific research to advance, but many responses stressed a sooner update for policy-relevance.**

Increasing workload

IPCC workload continues to increase and weighs heavily on the authors shoulders.

- **From AR4 to AR6, the number of climate change literature publications and the number of submitted review comments have increased by more than 500% and 260%, respectively**, whereas average author team sizes have only increased by 140% (and actually decreased in size between AR5 and AR6).
- **The expanding literature basis requires increased, dedicated support to be able to be assessed robustly.** Ways to reduce the burden include increasing the number of Contributing Authors and Chapter Scientists, undertaking systematic literature reviews (only 18% said they did this in AR6), have more focused assessments so less literature needs to be assessed, and relying more on larger review papers or pre-assessed topics from the scientific community (72% said these types of publications were useful to do the assessment).

- **Authors based in regional chapters were statistically significantly more likely to answer yes to reviewing non-English literature than authors in the global or process chapters.** 20% of survey responses said that non-English literature was assessed in their chapter. Suggestions for how the IPCC can increase the diversity of assessed papers in the future included having a more diverse author team, creating guidelines on how to assemble and select papers to cite in the report, making calls for papers and soliciting more diverse reviewers, and using artificial intelligence translation tools.
- **Using outdated tools to deal with review comments hinders the efficiency of the process and places additional burden onto the authors, Review Editors and Chapter Scientists.** Many suggestions called for a more modern, inclusive, online tool to assemble, analyse and monitor review comments and their responses. This would negate the need to merge spreadsheets after parallel working, stop accidental duplicated responses, and keep a cloud-based backup saved.
- **Novel AR6 initiatives like the FAIR data practices, enhanced efforts in communication and outreach, and co-designing SPM visuals have seen clear benefits** that enable the IPCC to more effectively and more transparently communicate the assessment's key findings but they require additional resources, such as additional funding to bring in external expertise and internal support roles to facilitate the process. Over 40% of WGI authors said they were involved with and supported the FAIR data principles. Over 70% viewed the co-developed SPM figures as being successfully accessible, usable and clear. And the majority of survey responses found the available communication and outreach products useful.
- **COVID-19 was a huge amplifier to an already strained and pressured working environment.** Although survey responses showed that individual experiences of the pandemic greatly differed, overall, the workload increased both in magnitude and in duration. The dedication of authors made finalising the assessment possible.

Lessons learned from virtual working

Overall, positive lessons learned from virtual working should be taken with caution.

- **Developing country authors were statistically far less likely to state that there are positives to virtual working than developed country authors.** The listed positives that authors took from switching to virtual working included travelling time and CO₂ saved, online calls (if inclusively facilitated) could be more effective for those attending them, recording meetings allowed people to catch-up or rewatch discussions, and the scheduling of meetings / the people attending was more flexible than in in-person LAMs.
- **People who are less familiar with the report content or have greater barriers to participation statistically have a preference for activities to be in-person rather than in a virtual format.**

The authors' experience

Despite several suggestions on how to do things differently, authors stated many reasons they were proud of what they had achieved.

- **Creating a report with enhanced integration and a robust assessment, creating**

something novel and useful, teamwork-related aspects of the IPCC experience, and the fact the chapter was able to be completed under difficult circumstances were themes from the survey responses relating to what authors were most proud of in their chapter assessment.

- **Suggestions for how to improve the process including chapter dynamics and how to improve the content of parts of the report** were stated in the responses on what authors would have done differently. Some authors simply responded that they would not have done anything differently.
- **The offered training and guidance documents to support authors in their assessment was appreciated but earlier guidance and training on the process and the expectations for doing the assessment was needed.** Appreciated training fell into three categories: guidance on how to do the assessment, training on the supportive tools available, and facilitation and team-building training. All themes received comments saying these types of training could have been strengthened. Suggested new activities for further training/learning in future assessment cycles included analysis/methodological training and scientific research webinars to help broaden perspectives early on in the process.

Other themes

Other themes that emerged from the survey responses despite not having dedicated questions on these topics included authors dropping-out or no-longer being able to contribute during the process, ethics of authorship and recognition, and inclusive practices, unconscious biases and barriers to participation.

- **There is an unequal distribution of workload across authors in the report-writing process.** Contributions, no matter how small, should always be recognised but author drop-off increases the imbalance of workloads in an author team, causing remaining authors to take on even more responsibility as a result. Reasons for why some authors do not contribute for the full length of the process can only really be speculated here, as the ones who no longer contribute to the report are probably the ones who also do not complete this survey. The COVID-19 pandemic undoubtedly impacted some authors' contribution more than a 'usual' IPCC cycle.
- **The contributions from both CAs and CSs were undoubtedly appreciated in the survey responses and their contributions should be appropriately reflected.** The debate around ethics of authorship and recognising contribution must be met with efforts to include diversity and truly have a globally representative assessment as much as possible. The responsibility for recruiting CAs must include greater efforts to have regional representation.
- **The survey responses included a variety of examples of non-inclusive behaviours that caused barriers to some author's participation.** Although the inclusive practice training supplied to authors was appreciated overall, this training needs to go further to ensure that all individuals become mindful of unconscious biases and exclusive behaviours.
- **The Bureau and TSU can play a vital role to guide, coordinate, facilitate and mediate discussions throughout the entire report process.**

Introduction

The IPCC's Sixth Assessment Cycle (AR6) ran from October 2015 to July 2023 and comprised seven individual reports (the busiest IPCC cycle to date). The Working Group I (WGI) contribution to the IPCC AR6 was approved and accepted in August 2021. 234 authors from 64 countries led the assessment of the understanding of the current state of the climate, including how it is changing, the role of human influence, the state of knowledge about possible climate futures, climate information relevant to regions and sectors, and limiting human-induced climate change. This report draws on responses from a feedback survey of over 150 Authors and Review Editors on the successes, challenges and lessons-learned from the WGI AR6 experience. The survey was developed by the WGI Bureau and TSU and sent to all WGI authors and Review Editors. It focused on both the WGI AR6 *process* and the resulting *products*.

The WGI Bureau, supported by the WGI TSU, tried to incorporate several novel aspects to the process and the resulting report. These included:

- **Enhanced integration:** The WGI AR6 report supported a more integrated structure and was more interconnected with its Working Group II and Working Group III counterparts than in previous cycles. Rather than presenting lines of evidence separately in specific chapters as was done in AR5 (e.g., model evaluation, observations, paleo evidence), chapters were developed to include multiple lines of evidence and were structured around three broad categories: global climate change (Chapters 1-4), underpinning physical climate processes (Chapters 5-9), and regional climate information (Chapters 10-Atlas).
- **Enhanced efforts and co-design for communications and outreach products:** Following the 2016 IPCC Expert Meeting on communications¹, science communication and design experts were involved during the preparation of the report and a strong effort to co-design the report key messages and multiple outreach and communications products.
- **Incorporating FAIR data principles:** WGI implemented FAIR data principles (findable, accessible, interoperable, and reusable) during the AR6 process, the first time in the IPCC process. This included a systematic approach to document the data used in figures through data tables and a more advanced data and code archival process. FAIR principles were fully implemented in the WGI Interactive Atlas, including all provenance information.
- **Implementing new approaches towards a more inclusive environment to participate in the process:** WGI led a more 'bottom-up' process compared to AR5 to support full participation in the preparation of the report. Inclusive and participatory practice training was established early in the report writing process and support was provided throughout.

Furthermore, the COVID-19 pandemic led to the drafting of the WGI report switching entirely to remote working early in 2020. This resulted in multiple new approaches being developed to try and adapt to the new way of working, including the planning and implementation of the first virtual approval ever organised by IPCC.

This survey and resulting report is one of several being developed by the WGI Bureau and TSU at the end of the AR6 cycle. Collectively, they aim to objectively assess the WGI

¹ <https://www.ipcc.ch/event/ipcc-expert-meeting-on-communication/>

contribution to the AR6, to identify positive and negative lessons learned from the experience. The other surveys and reports recently completed or in development are:

- [A report based on a survey sent to WGI Chapter Scientists](#)². A role that is now essential in the IPCC. The survey aimed to understand the roles and responsibilities that the CSs were tasked with and ask their view on the role and how it should evolve in the future.
- Two reports on inclusive practices and barriers to participation that were developed and analysed by SHIFT Collaborative³ in collaboration with the WGI TSU. [The first report](#)⁴ gives an initial look at what efforts were made by WGI during the AR6 based on surveys that were run during the cycle. The second report⁵ builds on a retrospective survey and several focused workshops to discuss what could be done in the future.

From these complementary analyses, the WGI Bureau and TSU will synthesise recommendations for the AR7 before Plenary 59, scheduled for July 2023.

About the survey

Questions

The WGI AR6 Participants Survey consisted of 80 questions that were focused around either the *process* of drafting the report or resulting *outcomes*. It was sent to all WGI Coordinating Lead Authors (CLAs, 2-3 per chapter), Lead Authors (LAs, 12-15 per chapter) and Review Editors (REs, 2-3 per chapter). A copy of the survey questions can be found in **Annex I** of this report. No questions were mandatory and, as such, authors could complete only part of the survey if they preferred. The questions were arranged by theme that included:

- the report structure,
- the chapter assessment,
- coordination needs across chapters and working groups,
- the Technical Summary,
- the Summary for Policymakers,
- activities in the context of the COVID-19 pandemic.

The questions asked for feedback on their experiences and views retrospectively but also asked for recommendations for future assessment cycles. The survey ran from 01 February to 05 March 2022, approximately 6 months after the approval of the Summary for Policymakers but when the report production was still ongoing.

Responses

152 responses out of a possible 234 were received (65%). Of the responses:

- 18% were CLAs (28 out of a possible 31, 90%), 71% were LAs (108 out of a possible 167, 65%) and 10% were REs (15 out of a possible 36, 42%);
- 25% identified as female, 74% identified as male and 1% preferred not to say (28% of the selected WGI authors and REs identify as female);

² <https://zenodo.org/record/7576668>

³ Shift Collaborative (<https://shiftcollaborative.ca/>) provided training to AR6 WGI participants (Authors, Review Editors, Bureau and TSU staff) throughout the preparation of the report.

⁴ <https://zenodo.org/record/7615959>

⁵ URL link to be added at a later date.

- 67% were new to the IPCC (compared to 63% of the selected authors and review editors);
- 34% come from a country classified as developing or with economies in transition and 66% come from a country classified as developed.

Figure 1 shows the ‘primary’ nationality as chosen by the participants and their corresponding region, as indicated by the WMO regional classification. **Table 1** shows the statistical regional breakdown of the survey responses compared with the statistical regional breakdown of all selected WGI Authors and Review Editors. The regional distribution of survey responses roughly matches the regional breakdown across all selected Authors and Review Editors although there is a higher percentage of responses from Europe (+6%) and reduction of responses from Africa (-6%).

Table 1: Regional percentages of all selected WGI Authors and Review Editors compared with percentage regional breakdown of respondents to the authors survey. 1% of survey responses did not answer the question on nationality.

Region	% from selected authors (n=234)	% from survey responses (n=152)	% difference
I: Africa	9	3	-6
II: Asia	21	18	-3
III: South America	8	9	+1
IV: North America, Central America & Caribbean	15	16	+1
V: South West Pacific	9	8	-1
VI: Europe	39	45	+6

The response rates for WGI Authors and Review Editors correspond to 41% and 59%, respectively. At least 50% of Authors and Review Editors responded per chapter, with the average having a 65% response rate; the highest was Chapter 8 (83%) and the lowest was Chapter 4 (50%).

Survey Participants: region & primary nationality

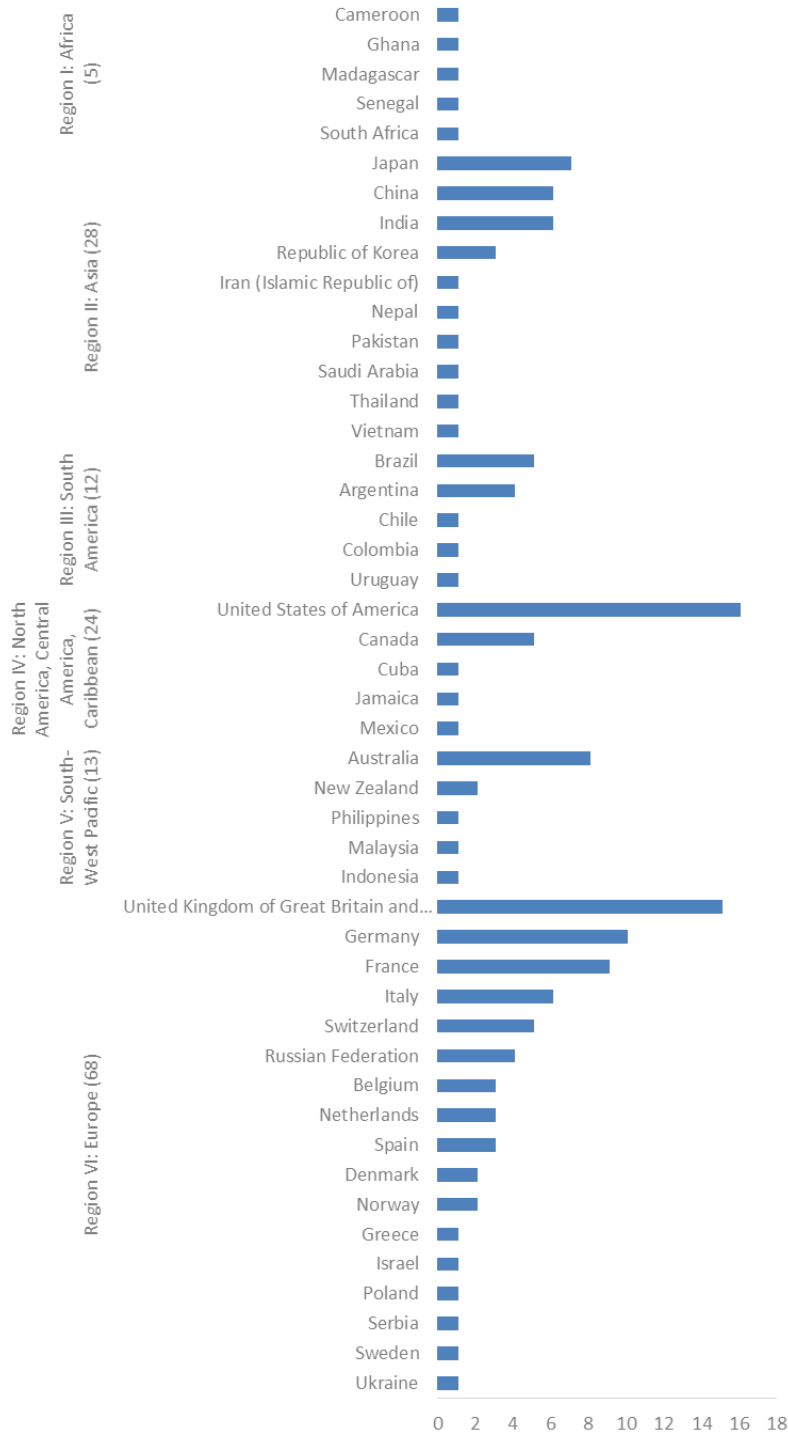


Figure 1: Overview of WGI author survey responses showing participants' self-identified 'primary nationality' and the associated WMO region classification. Regions are Region I: Africa, Region II: Asia, Region III: South America, Region IV: North America, Central America, Caribbean, Region V: South-West Pacific, Region VI: Europe. Numbers in brackets show the total number for that region. n=150 out of a possible 152 responses.

Tests of statistical significance

The survey contained several questions that could be quantitatively analysed. Most of these questions were analysed for statistical significance across identified groups of respondents (see **Annex I** for the full list of survey questions and **Annex II** for the list of questions upon which were analysed for statistical significance). These respondent groups were:

- Coordinating Lead Authors *compared to* Lead Authors
- New to AR6 *compared to* Authors also in AR5 or before
- Native English speakers *compared to* non-native English speakers
- Developed country authors *compared to* Developing country authors
- Authors who identified as male *compared to* Authors who identified as female
- SPM authors *compared to* Authors not involved with the SPM
- TS authors *compared to* Authors not involved with the TS
- Global chapter authors (CH1-4) *compared to* Process chapter authors (CH5-9)
- Global chapter authors (CH1-4) *compared to* Regional chapter authors (CH10-Atlas)
- Process chapter authors (CH5-9) *compared to* Regional chapter authors (CH10-Atlas)

Statistical significance *T*-tests were run using *p*-values of 0.05 and 0.01. Non-equal variance *T*-testing and also binary *T*-tests were run between groups where necessary. See **Annex II** for more details.

Analysis and Results

Report structure and scope

Report Structure

When asked about the suitability of the new AR6 report structure, survey responses showed a resounding overall support for the more integrated AR6 design compared with AR5. 84% (123 out of 146) responded that the structure was either “completely suited” or “suited a lot” to the assessment of the physical basis of climate change (**Figure 2**). There were no statistically significant differences between the respondent groups showing this distribution of responses was reflected across all groups.

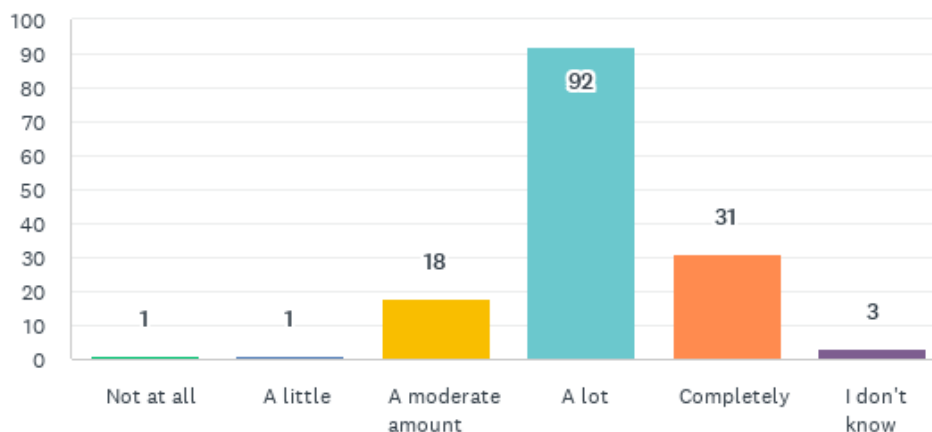


Figure 2: Q8. In your view, was the report structure well suited for the assessment of the physical basis of climate change? n=146

Participants were asked to list the associated strengths and weaknesses associated with the AR6 report structure. Of the 149 responses, 129 (87%) gave examples of strengths and 109 (73%) gave examples of weaknesses.

Strengths listed were:

- Better handshake to other Working Groups compared to the AR5, particularly the Working Group (WGII) with Chapter 12 & the Atlas, for example, greater focus on the regional scale.
- More integrative (a more holistic approach) across and within chapters, combining multiple lines of evidence. This made the report more user oriented.
- There was greater framing and focus on more policy-relevant topics. Gave visibility to topics such as the water cycle and extremes as they were separated out.
- Clear structure of global, processes, regional, made it comprehensive & more balanced.

Weakness listed were:

- Structure created overlaps across chapters which took time to properly scope and ensure repetition was minimised and overlaps were treated consistently. Topics particularly affected were the water cycle including drought, cryosphere related material, and some regional chapter topics.
- Greater integration comes with greater coordination costs, more time and resources needed to do the assessment.
- Some topics were less visible due to their integration across several chapters, for example, on topics such as paleo and model evaluation, which are less visible compared to AR5. This makes it harder for report users to access material on these topics, including the need to follow more cross-references to other sections.
- Silos for some chapters still existed, for example, the three 'groups' of chapters were still relatively isolated.
- Topics could fall through the gaps and risk not having a location, for example, coordination related to clouds came late in the process.

Several responses acknowledged that the new structure came with both strengths and weaknesses but the overall the general view from the responses was that the strengths outweigh the weaknesses, as exemplified by one such quote, *"Overall, judging from the final result, I believe that the pros overtake the cons by far"* (LA, Europe).

Summary: A greater focus on integration, across WGI topics and across Working Groups, was appreciated by authors, making the report more policy-relevant and user-orientated. Over 80% of responses thought the structure of the report was well suited for the AR6 assessment. The drawbacks to this structure were that much more coordination was needed and the locations for some topics were hard to place or missed/overlooked. Overall, the strengths out-weighed the weaknesses.

Cross-Chapter and Cross-Working Group Coordination

Due to the more integrative nature of the WGI AR6 report, participants were asked their views on which cross-chapter and which cross-working group topics were successfully and unsuccessfully coordinated and why. Responses differed on what specific scientific topics participants thought were well coordinated or uncoordinated, assumingly due to the specific

topics that the respondents were themselves involved with. Some topics also received conflicting feedback (some viewed them as well coordinated, others viewed them not well coordinated), for example, some water cycle, extremes and regional aspects.

Good coordination mechanisms

When asked what mechanisms worked well to foster good cross-chapter (n=43) and cross-working group (n=44) collaboration, several common themes emerged. Responses primarily related this success to the role of facilitators or coordinators to help drive progress and decision-making. These were either selected/nominated or volunteer authors, Bureau members or TSU members who would organise calls, plan timelines, facilitate discussions (orally but also online via slack or Google Docs etc.), and share the actions / decisions made by the group. Having early and continuous active team participation also helped ensure decisions were implemented and stuck to. Some topics that didn't have participation from all relevant chapters or working groups, and therefore did not have all relevant views taking part in the discussion, would take longer to address and implement. This would also increase the chance of needing to repeat discussions and change decisions later on in the process. One response recommended that relevant CLAs and section leads should attend the LAMs from other Working Groups to aid cross-Working Group coordination.

AR5 VS AR6 WGI REPORT STATISTICS

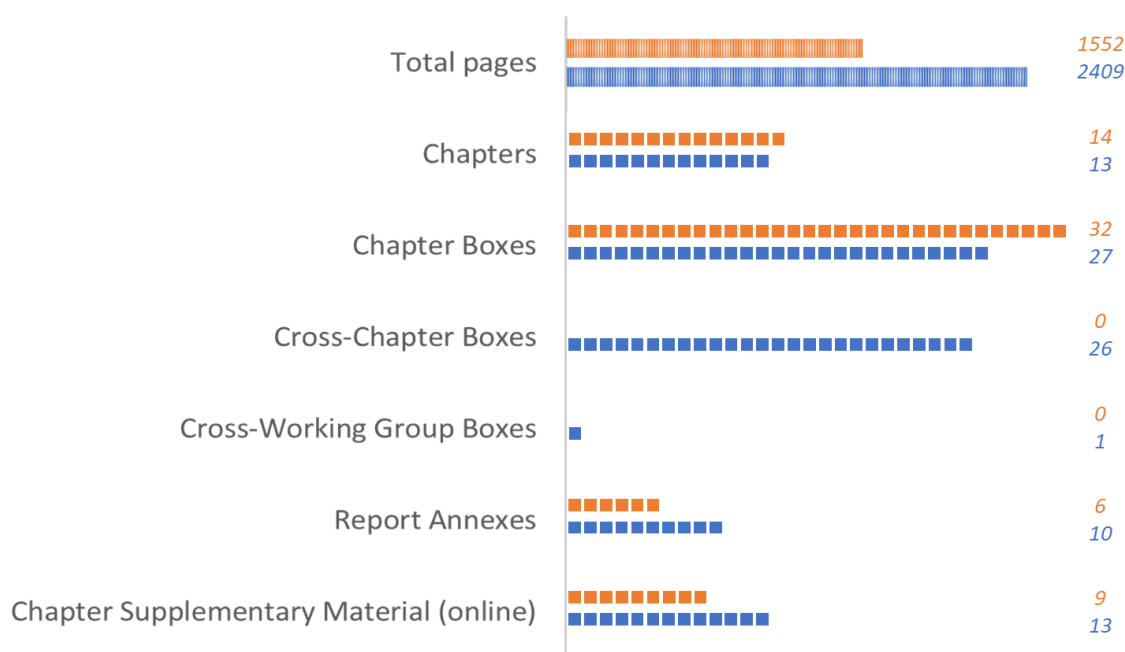


Figure 3: Infographic showing several differences in the structure of the WGI report from AR5 compared to AR6. Note: Several Cross-Chapter Boxes included contributions from other Working Group Authors but a Cross-Working Group Boxes was defined as a box that appears identically in more than one Working Group Assessment Report.

Another positive feedback for enhancing cross-chapter and cross-working group collaboration was that WGI provided dedicated space in the report for an assessment of these topics. An overview of how the WGI AR5 and working group AR6 structures differed in terms of space for supporting the assessment can be seen in **Figure 3**. Cross-chapter and cross-Working Group boxes were novel additions compared to the AR5. Having these dedicated spaces, along with additional annexes and online chapter supplementary material,

allowed for further integration of the assessment. Survey responses also stated that processes like writing the Technical Summary, allowed authors the space to do a more integrated assessment. Recognizing coordination efforts by including Lead Authors as Contributing Authors on relevant chapters helped to facilitate cross chapter/ working group coordination. Inviting key Coordinating Lead Authors to relevant Lead Author Meetings aided further discussion, coordination and decision making. There were a total of 615 unique Contributing Authors to the WGI AR6. Many Contributing Authors gave input to more than one chapter. The total including duplicates stands at 957 CAs across the report. 135 CAs were LAs or CLAs from the WGI AR6, showing that many authors contributed to chapters other than their own (22% of CAs were WGI authors, 58% of authors were CAs on other chapters). In addition, 33 CAs were authors from the WGII report and 8 CAs were authors from the Working Group III (WGIII) report.

Reasons for less well-coordinated topics

Running out of time or starting too late in the process (and therefore having to rush to coordinate some topics), personality clashes, struggling to get author engagement, and no clear ownership for certain topics were reasons given in the survey responses for why some topics were unsuccessfully incorporated across chapters. Lack of time was also suggested as a reason for unsuccessfully coordinated cross-working group topics but other, different reasons included the separation across working groups becoming more “artificial”, barriers due to different terminologies across working groups, and the staggered timelines making it harder to make effective decisions.

Summary: Overall, having established mechanisms helped to further integrated assessments. Dedicated teams (including other WG authors where relevant) that were established early in the process and had clear objectives but also who had identified leads/facilitators to run and drive discussions in an inclusive manner (often with support or guidance from the Bureau and/or TSU) led to a more integrated assessment. Having dedicated spaces for such assessments also enabled a robust process.

Looking towards AR7

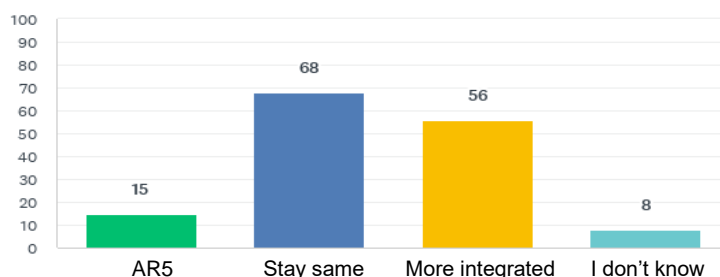


Figure 4: Q10. How should the WGI report structure be modified for the next assessment cycle?
n=147

The majority of responses indicated a preference to have the WGI AR7 in a similar level of integration as the WGI AR6 (46%) but there was still a sizable portion of respondents who thought the WGI AR7 should continue to be more integrated (38%) (**Figure 4**). One reason for keeping the AR6 level of integration was that now the report structure is established it will be easier to repeat in AR7. Several responses stated that the structure should still be

modified to reduce overlaps, shorten and elevate some topics that were less visual in the AR6 structure, for example, model evaluation.

Suggestions for how the WGI could be further integrative included:

- To be more policy-relevant, focus more solutions-oriented with adaptation and mitigation (boundaries between the three working groups are now less distinct)
- Refocus the report as continental chapters with global parameters as annexes
- Restructure the report around policy-relevant questions rather than systems to make more user orientated
- Minimise overlaps by having fewer chapters, for example, integrate mean and extreme climate changes, use scenarios to integrate more
- Incorporate longer 'super cross-chapter boxes' to complement chapter assessment
- Make WGI globally focused report but then combine regional climate changes and impacts into a separate report, merging with the WGII assessment

10% of responses suggested reverting back to a more AR5 type structure. Reasons included that the AR5 structure was more organised, more comprehensive, and more focused on 'hard science'. Of the responses that answered 'I don't know' (5%), some proposed to ask this question to end users of the report or stated that they thought the Special Reports were more impactful structures (reports that spanned across multiple working groups).

Statistical analysis showed that authors who identified as female and TS authors were significantly more likely to prefer a more integrative structure in AR7 compared to male or non-TS authors, although both mean values for each dataset were in between 'Remain approximately the same' and 'Integrate further to be more interdisciplinary'⁶.

When asked which science topics will be particularly policy relevant for the next assessment⁷, 41% suggested topics that either integrated WGI more with other working groups (e.g., feasibility of global goals, carbon dioxide removal, impact assessments, and loss and damage) or they mentioned the AR7 containing more special reports. **Figure 5** shows a list of the commonly suggested topics / themes as analysed from the survey responses. Other topics stated included regional aspects (great spatial resolution, more comprehensive regional assessment, great focus on cities), projections and climate models (model evaluation, constraining projections, great focus on climate variability), extremes and tipping points, aerosols, and other more-process oriented focuses.

⁶ Note that, like non-TS authors, non-SPM authors were also less likely to think the AR7 structure should be more integrative although this difference was not statistically significant.

⁷ Q77: In your view, considering the science advances and knowledge gaps identified in your assessment, which science topics will be particularly policy relevant for the next assessment? (n=98)

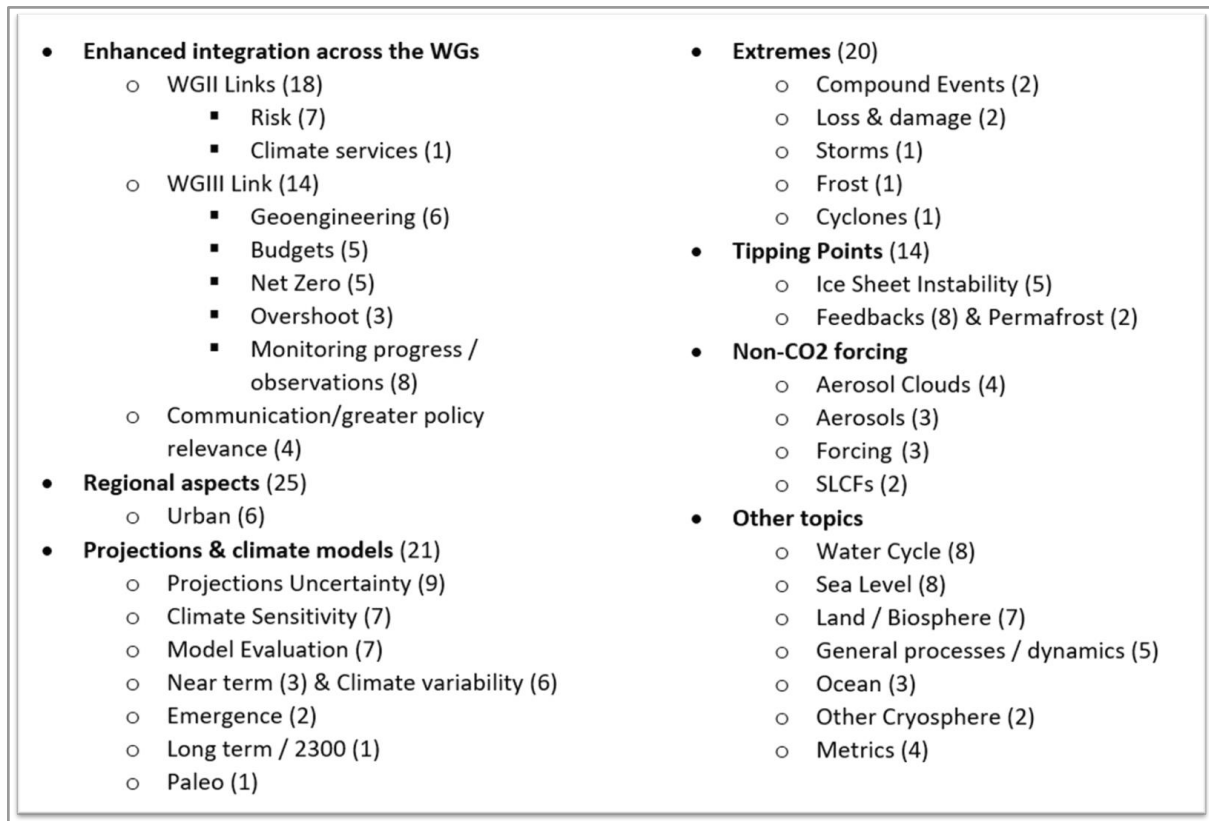


Figure 5: Schematic showing clustered topics from the responses of Q77: In your view, considering the science advances and knowledge gaps identified in your assessment, which science topics will be particularly policy relevant for the next assessment? n=98. Number in brackets indicates the number of times this topic was mentioned in the survey responses.

Although the timeline for IPCC reports are determined by the IPCC Panel each cycle, the authors were asked their opinion of when the next WGI report should be released and why⁸.

Figure 6 shows a heterogenous display in the responses. The rationale differed greatly depending on the time frame selected:

- **3-4 years:** Stressed the urgency & noticed the increasing speed of climate change called for more regular updates and be in time for the 2027 Global Stocktake. One response even suggested the IPCC report be replaced with annual updates.
- **5-6 years:** release would be in time for 2030 and the timing still stresses urgency. One comment stated that as the literature is expanding so rapidly then gaps should not be left too long.
- **7-9 years:** these responses focused around giving time for CMIP7 and for science to develop. Some responses stated this timeframe replicated the time between AR5 and AR6.
- **10-12 years:** Similar rationale as for 7-9 years but some also stated that this longer timeframe would be complemented by a special report that could be released earlier on. One comment stated that a longer timeline reduces the burden on the science community.

There were several comments saying focused reports / special reports would require shorter timelines. Three comments added to this and gave two time frame options (4 and 10 years, 5 and 8 years, 5 and 10 years), stating that a targeted report could be released in the short

⁸ Q76: In how many years time should the next WGI report be released and why? (taking into account a report needs ~3 years to be drafted) n=124

term and then a full assessment report (including CMIP7) can be released several years later.

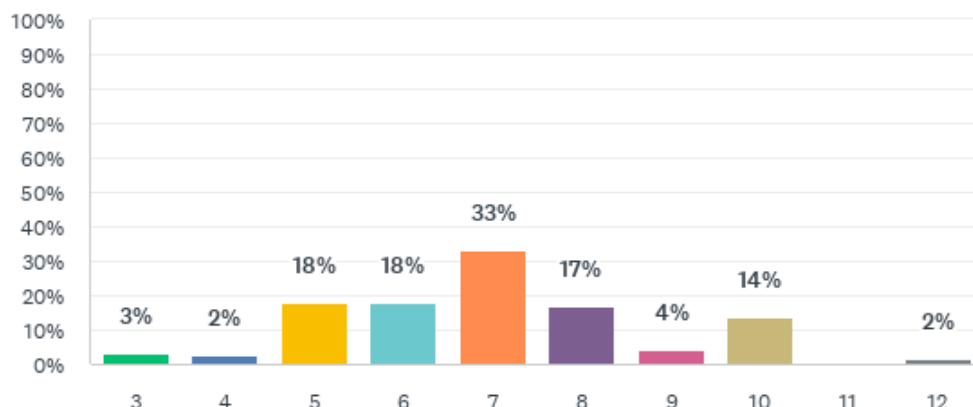


Figure 6: Q76. In how many years time should the next WGI report be released and why? n=124

Summary: Authors were divided on how the WGI should evolve in AR7, with almost half of responses preferring WGI AR7 to have a similar level of integration as the AR6 and a third of responses preferring an even more integrated structure.

Identified policy-relevant topics relating to WGI for AR7 were interconnected topics with the other working groups such as links to risks, impacts, net-zero, and mitigation monitoring. Increasing regional focus, further evaluating projections, attributing extremes, and further understanding tipping points also were listed many times as topics of focus.

Overall, authors preferred for the next WGI assessment to be released with enough time for the next CMIP to be established, to allow the scientific research to advance, but many responses stressed a sooner update for policy-relevance.

Increasing workload in the AR6

Over the 30+ year history of the IPCC, both the interest in the IPCC and the amount of work to contribute to the process have substantially increased. So too has the amount of literature available to be assessed. **Figure 7** shows the number of 'climate change' tagged papers from the top 10 most cited journals used in the AR6 WGI as according to the website Web of Science since the establishment of the IPCC. These numbers are compared with the increasing number of submitted review comments for the last three WGI reports (AR4-AR6) and the number of authors selected for each WGI report (FAR-AR6). Although author team sizes have on average increased throughout the IPCC cycles, the rate of increase does not match the exponential rise in publications, nor the rise in review comments submitted to each report that has been seen throughout the same time period. From AR4 (2007) to AR6 (2021), the number of climate change literature publications and the number of submitted review comments have increased by more than 500% and 260%, respectively, whereas average author team sizes have increased only by 140%⁹, and in fact, author teams overall decreased in size in AR6 compared to AR5.

⁹ Several reasons exist for why larger author sizes may not be possible, for example, budget allocation for trust funded travel grants, finding suitable venues, larger teams are harder to coordinate.

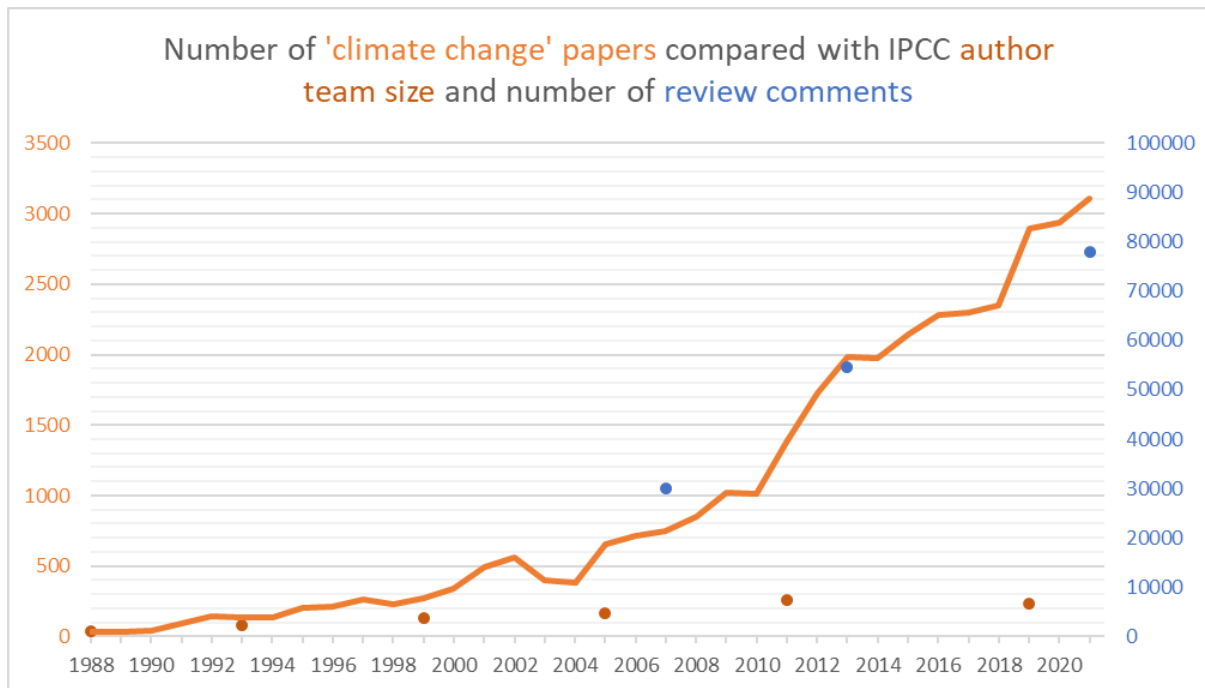


Figure 7: Web of Science (<https://www.webofscience.com>) search results of the number of papers tagged with 'climate change' from the top 10 most cited journals used in the AR6 WGI¹⁰ from 1980 until 2021 (orange line) compared with the number of submitted review comments submitted on the Working Group I report (blue dots, AR4-AR6 only) and the number of selected authors in for each Working Group I report (orange dots, FAR-AR6, second y-axis on the right hand side).

In the survey, authors were asked questions to gather their views on how to assess the increasing literature basis and how to improve the process of responding to review comments.

The expanding literature basis

102 responses were submitted to the question “How to effectively deal with the increasing volume of available literature when undertaking an assessment”. Most suggestions fell into one of three categories: providing extra support to do the assessment, making future assessments more focused, or designing a more strategic process for conducting the assessment in future cycles.

Suggestions for providing extra support included increasing the number of Authors, Contributing Authors or Chapter Scientists within chapters, for example, more Contributing Authors could be tasked with assessments of specific/isolated topics. The TSU could support a shared literature library or reference bank was also suggested. This would additionally help improve access to literature, which is a barrier faced by some authors (more details below).

¹⁰ Geophysical Research Letters, Journal of Climate, Climate Dynamics, Nature Climate Change, Environmental Research Letters, Atmospheric Chemistry and Physics, International Journal of Climatology, Nature, PNAS and Nature Geoscience (in order of number of times cited in the WGI AR6). Analysis from <https://zenodo.org/record/7615825#.Y-J8AYSZNaQ>.

Some responses argued for the IPCC assessment to become more focused in the future. Rather, to do future assessment on specific topics or areas of particular policy relevant or knowledge gaps instead of providing updates to already assessed topics. This would decrease the number of papers needed to be assessed. Alternatively, the IPCC could rely more on larger review papers or pre-assessed topics from the scientific community (e.g., from WCRP). When asked whether community-driven reviews were helpful in the WGI AR6 assessment, 72% (n=143) answered that they were and 65% (n=141) thought that more should be produced in the future.

Finally, other suggestions for dealing with the increasing literature basis was to use more strategic processes, such as reviewing papers first on their methods, then reviewing on their results if their methods were robust and/or if they have shared datasets, or to conduct systematic reviews to help filter the literature basis. In this assessment, only 18% (n=143) answered yes when asked if they undertook systematic literature reviews¹¹. There can also be a risk of selection bias if systematic literature reviews are not done.

As many publications are behind paywalls, the IPCC UNEP reference library to aid authors from developing countries accessing research papers. Despite 41% of WGI authors coming from developing countries, only 3% (n=144) answered Yes to whether they used the service¹². Most responses stated that their host institutions provided sufficient access, but others commented that the service needed “more journals/papers needed to be included” (LA, Europe) and “more easy access” (RE, Asia). One response from a developed country author stated that “Others have had severe problems accessing the literature. The UNEP library does not seem adequate” (LA, Europe) and another pointed out that providing such a service “is fundamental for those wanting (legal) access to the breadth of literature” (LA, Africa).

Although the literature basis is increasing, only a handful of citations in the WGI AR6 are not written in English (approximately 11 out of 13 500 unique references cited in the report). When asked if non-English literature was considered in their chapter’s assessment, 20% (n=142) responded that they did, although several responses flagged that this literature may not have ended up in the final reference list as not all literature assessed ends up being cited in the final report. Papers in Arabic, Bangla, Chinese, Farsi, French, German, Italian, Japanese, Portuguese, Russian, Spanish and Ukrainian were reported to be assessed. Some authors commented that English language papers were sufficient due to, for example, the continental/global perspective of the IPCC reports.

Authors based in regional chapters were statistically significantly more likely to answer yes to reviewing non-English literature than authors in the global or process chapters. Authors who identified as male were more likely to answer yes than authors who identified as female and, somewhat surprisingly, authors who stated their only working language was English were also statistically significantly more likely to answer yes. This seems like a slightly counter intuitive result, perhaps native-English speaking authors assumed their non-native English colleagues assessed non-English literature? Or perhaps native-English speaking authors tried to recruit non-native English speaking Contributing Authors to assess the literature base they were not able to assess?

¹¹ Q13: Did you undertake a systematic literature review? Systematic reviews are a type of review that uses repeatable analytical methods to collect secondary data and analyse it. n=142

¹² Q12: Did you make use of the UNEP library resources to access literature? n=144

Suggestions for how to improve the diversity (language and geographical origin) of literature that is assessed and cited in future IPCC assessments¹³ fell into two themes: those that fell within the remit of the IPCC and those that fell outside of the IPCC and more with the scientific community more widely:

- Within the IPCC
 - Recruit LAs and CAs from a great diversity of countries who speak a greater diversity of language (role of Focal Point)
 - Create IPCC guidelines for how to select more regionally balance and diverse literature when cited in the report
 - Have an official IPCC call for papers in many languages that can be shared with publishers across the globe
 - More actively soliciting reviewers and recruiting authors that represent the languages/regions that are currently not well represented
 - Ask author teams to assemble important journals that publish in non-English
 - Use automatic / artificial intelligence translation tools
- Outside of the IPCC
 - Increase capacity building to encourage more publications from regions where publications are fewer
 - Encourage non-English journals to have English-language abstracts
 - Coordinate with national science academies or encourage national-level climate assessments (that can already cite relevant non-English literature), which can be used as a basis or starting point for the IPCC assessment.

Note that a few responses stated against including non-English papers, for example, “I think we need to stick with English literature, and cite only the studies published in the well-known peer-reviewed journals” (LA, Asia).

Summary: IPCC workload continues to increase and weighs heavily on the authors shoulders. From AR4 to AR6, the number of climate change literature publications and the number of submitted review comments have increased by more than 500% and 260%, respectively, whereas average author team sizes have only increased by 140% (and actually decreased in size between AR5 and AR6).

The expanding literature basis requires increased, dedicated support to be able to be assessed robustly. Ways to reduce the burden include increasing the number of Contributing Authors and Chapter Scientists, undertaking systematic literature reviews (only 18% said they did this in AR6), have more focused assessments so less literature needs to be assessed, and relying more on larger review papers or pre-assessed topics from the scientific community (72% said these types of publications were useful to do the assessment).

20% of survey responses said that non-English literature was assessed in their chapter. Authors based in regional chapters were statistically significantly more likely to answer yes to reviewing non-English literature than authors in the global or process chapters. Suggestions for how the IPCC can increase the diversity of assessed papers in the future included having a more diverse author team, creating guidelines on how to assemble and select papers to cite in the report, making calls for papers and soliciting more diverse reviewers, and using artificial intelligence translation tools.

¹³ Q16: Do you have any suggestions to improve the diversity (language and geographical origin) of literature that is assessed and cited in future assessments? n=90

Handling Review Comments

As shown in **Figure 7**, the number of review comments submitted during the WGI reviews over the assessment cycles has increased substantially whereas the core author team sizes have plateaued. The survey focused two questions on the review comments¹⁴. Both questions had many overlaps in their responses and so were analysed together. When authors were asked how the first and second draft reviews could be improved, many responses to this open-ended question stated that the mandatory requirement for all comments to have a response was a significant burden. This was not only due to the large number of review comments but also because the basic excel tools are outdated and unsupportive for the task, for example, *“The sheer volume is a challenging task for the authors to deal with as every comment needs to be responded in writing”* (CLA, North America) and *“Update the way the reviews have to be submitted and answered. Working with the excel spreadsheets is very cumbersome”* (RE, Europe).

One theme among the suggestions for improving the process was to be more selective with responding to the review comments, for example, not requiring responses to the first draft review comments (*“A major issue was that so much changed between the FOD and the SOD, that so many of our responses to FOD review comments became obsolete”* LA, North America) or not requiring responses to all editorial comments (*“Separate out editorial comments -- no more written response to those”* LA, Europe). It was also suggested that the TSU provide more standard responses for common comments (*“While almost all comments are different, there are a lot of similarities as well. So, it would be useful to develop some common/standard responses to certain comments”* CLA, North America).

Although many acknowledged the process being difficult to manage, several responses voiced support for the process because it makes the reports more robust and is transparent, for example, *“For the robustness of the report, we need the review process as we have now”* (LA, Asia), and *“The current process is very open and transparent, and it needs to stay that way”* (CLA, South West Pacific).

Some responses suggested strategies for responding to comments, for example, to implement a two-phase method to respond to the comment with an initial phase where a rough answer is given or an answer is chosen from a drop-down selection (e.g., “Accepted”, “Rejected”, “Taken into account”). Then have the final full responses drafted when the text edits have been made. This strategy was implemented by several chapters but sometimes was challenging to motivate authors to go back and complete their answers. Other suggestions called for further guidance to reviewers, particularly in the first draft to not focus on editorial details but more on the report structure, overlaps and gaps (*“More guidance to reviewers on which types of review comments are especially helpful, e.g., drawing the attention of authors to literature of which they were unaware”*, LA, South West Pacific). Several comments mentioned making better use of the Review Editor role, for example, making the role more accountable, or mandating more regular reporting from the author teams to the review editors. One respondent mentioned the possible future role for machine learning / artificial intelligence to aid this stage of the process *“It feels like there could be a role for machine learning in aggregating review responses that are similar. This might enable a more rapid view of the emergent issues”* (LA, Europe).

¹⁴Q21: Do you have any suggestions to improve the efficiency and efficacy of the FOD and SOD review process? n=95 and Q24: All review comments require an appropriate response. Do you have any recommendations to improve the efficiency of responding to and checking review comments? n=101

Many suggestions called for a more modern, online tool to deal with review comments¹⁵. Having a live tool would negate the need to merge spreadsheets after parallel working, stop accidental duplicated responses, and keep a cloud-based backup saved. Additional suggestions for a more modern and supportive tool included:

- Provide a function that clustered similarly themed comments (both within a chapter and also across chapters)
- Interactive system to click on reviewer's email to ask follow up questions if needed
- Ability to tag comments with common statuses

The WGI AR6 provided training to Review Editors on the Review Editor Tool - a software developed by a WGII Vice-Chair with the aim to support comment analysis. TSU provided online and in-person training (at LAM3). Only one response mentioned the tool in response to these survey questions: *"I did try with the Review Editor Tool kit but found it too much overhead despite the promise of this tool. Could it be developed better ahead of AR7, and integrated into a review comment response tool? Might be a good way to track assignment of CLA/LA to RC's and which had been checked off by RE's"* (RE, South West Pacific).

Summary: Using outdated tools to deal with review comments hinders the efficiency of the process and places additional burden onto the authors, Review Editors and Chapter Scientists. Many suggestions called for a more modern, inclusive, online tool to assemble, analyse and monitor review comments and their responses. This would negate the need to merge spreadsheets after parallel working, stop accidental duplicated responses, and keep a cloud-based backup saved.

Novel AR6 initiatives

Throughout the AR6, WGI established and implemented novel practices to modernise the report, increase transparency and accessibility, and strengthen science communication. This notably included the development of an online Interactive Atlas of observed and projected climate variables, the widespread implementation of FAIR (findable, accessible, interoperable, and reusable) data principles¹⁶, the inclusion of science communication experts in the preparation, communication and outreach of the report, and the co-development of SPM visuals with a team of information designers, and cognitive and social scientists, and IPCC authors and staff¹⁷.

FAIR data principles

FAIR (findable, accessible, interoperable, and reusable) data principles were implemented for the WGI report, the first time in the IPCC process. This included a systematic approach to document the input data used as the basis of figures through data tables (Supplementary Material for each chapter). Intermediate¹⁸ and final (plotted) figure data are archived through the IPCC Data Distribution Centre¹⁹, and code is made available through the WGI GitHub

¹⁵ Note that online tools like google spreadsheets were not used due concerns around security and barriers to participation (several authors did not have access to Google products).

¹⁶ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9569379/>

¹⁷ <https://link.springer.com/article/10.1007/s10584-021-03171-4>

¹⁸ Intermediate assessment data is the outcome of data processing and analysis performed as part of the assessment. Data is only defined as intermediate if it has gone through non-trivial processing to be considered an original product, distinct from the input data.

¹⁹ <https://catalogue.ceda.ac.uk/uuid/3234e9111d4f4354af00c3aaecd879b7>

repository²⁰. FAIR principles were fully implemented in the WGI Interactive Atlas, including all provenance information. This process was developed during the AR6 as the report draft was also being developed.

Of the 134 responses, over 40% of authors said they were involved with aspects of FAIR data principles (**Figure 8**). 40 provided additional comments on the implementation of these principles. Overall, responses were very supportive of the initiative stating it aids the transparency of the IPCC but several comments stated that workload was cumbersome, for example, *“I fully support FAIR. However, I think it is not always appreciated just what a massive additional workload this brings.”* (LA, Europe). Several comments suggested that the process should have been established *“from the beginning”* as the development of the procedure while people were working caused confusion: *“Initially, I was very confused on what exactly we needed to be aware/provide”* (CLA, North America). There was a suggestion that *“templates of scripts for (for example) time series, maps and other types of plots can be provided in advance by TSU”* (LA, South America) to harmonise figures across chapters.

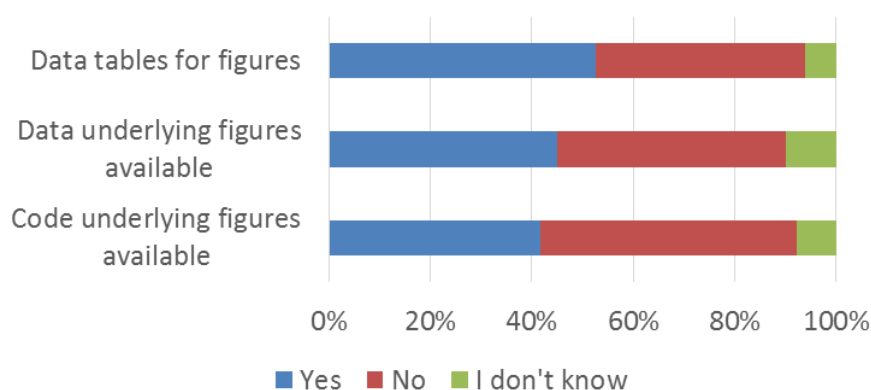


Figure 8: Q30. The implementation of FAIR data principles was recommended. Did you make or were you involved with preparing any of the following? *Data table for figures, Data underlying figures, Code underlying figures.* n=134

Co-development of SPM visuals

The co-design of SPM visuals with information designers, and cognitive and social scientists, as well as IPCC authors aimed to create visuals that are accessible, clear and usable. This was one of the initiatives that resulted from the IPCC Expert Meeting on Communications²¹ that recommended several ways to improve science communication of IPCC results.

Authors were asked to what extent the SPM figures were Accessible (reaching a broad audience), Usable (for multiple outreach contexts) and Clear (convey a clear message of the report’s synthesis and conclusions). Overall, the authors' view was that the figures were very successful (**Figure 9**). Authors thought the figures were slightly more Accessible and Usable than Clear. SPM and TS authors were statistically significantly more likely to think the figures were more accessible compared to non-SPM/TS authors (results averaging at ‘a lot’ vs ‘a moderate amount’). Perhaps showing a bias towards work they were involved with. There were no statistically significant differences in the clear and usable responses.

²⁰ <https://github.com/IPCC-WG1>

²¹ <https://www.ipcc.ch/publication/ipcc-expert-meeting-on-communication/>

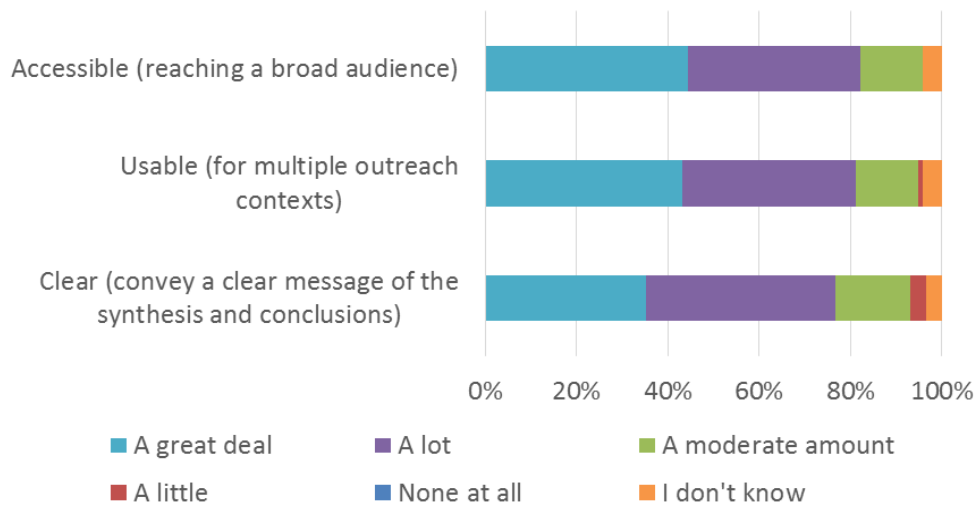


Figure 9: Q62. How successful is the SPM in the following aspects? *Findable, Accessible, Usable and Clear.* n=117

Some authors elaborated on their responses. The more positive comments included considering the figures as more successful compared to other visuals, for example, the TS figures. One comment stated that, as proof of their success, “*They were used without change by journalists!*” (CLA, Europe). Other, more neutrally toned comments included “*Some take time to explain, but are well understood after that.*” (LA, South West Pacific) and “*Success was limited primarily by the complexity of the topic not by the effort or approach.*” (LA, North America). There were several comments saying that despite thinking them successful, the figures remain too complex and hard for outreach, for example, “*Some of the figures are still technical and need some explanation from experts*” (LA, Africa) and “*A lot of text and annotations is not crucial for presentations*” (LA, Europe).

Of the 69 responses when asked about the co-design process, authors viewed the main areas for improvement as ‘author team dynamics’, ‘interaction between authors and the design team’ and synchronising the development of figures with the SPM text²². Specific suggestions included to include more voices from the Global South, start earlier in the process and spend less time explaining the fundamentals of design, focus effort on both authors and the design team understanding the main messages and potential issues in conveying them, and establish a clearer decision-making process. There was no comment saying the co-design process should *not* be continued, and several comments saying that the addition of this process strengthened the SPM, for example, “*I was very impressed with the process which I think worked very well, including trying very different models and structures at the beginning. It was not a waste of time even but a learning experience on how to better present the information*” (CLA, South West Pacific).

Extra focus on communications

Although media training was provided to SPM authors in AR5, integrating communication experts within the WGI TSU was a novel addition to AR6 which resulted in an added focus on communication throughout the AR6 process. Experts worked with the Bureau, Authors and Secretariat on a range of activities leading a bottom-up process for developing report-

²² Q60 Is there anything in the SPM figures co-design process that could be improved? (tick all that apply): Understanding the design tools in place (intent, peak of the story, etc.), Development of text and figures not synced, Author team dynamics, Interaction between authors and TSU design team, Bottom-up approach, Inclusivity, None of the above. n=69 Any suggestions for improvement? n=29

wide key messages, developing resources such as presentation slides and a go-to guide on WGI 'hot topics', and organising more extensive media training.

When asked which communication and outreach support products they used (**Figure 10**), the SPM figure slides, the Key Messages document, the press conference slides, and the Hot Topics documents were the most popular.

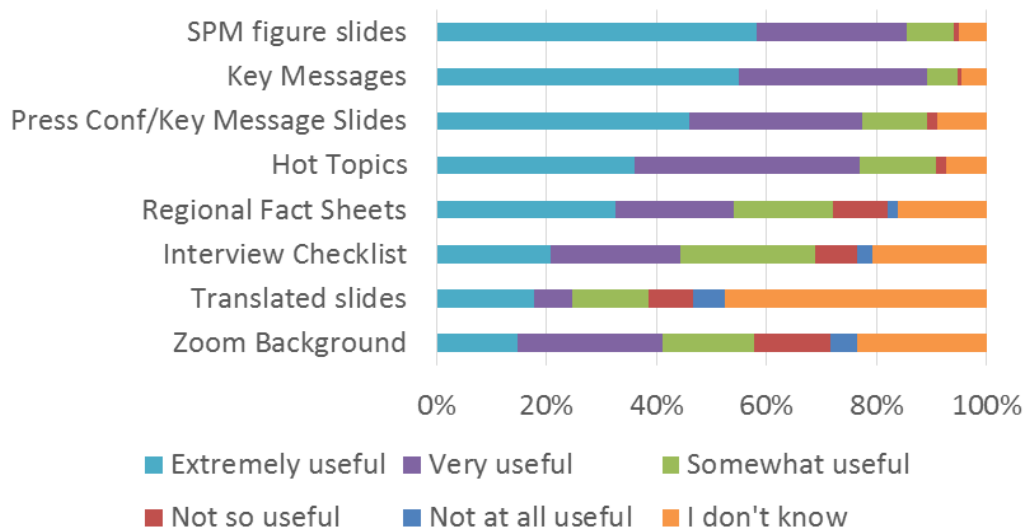


Figure 10: Q70. For any of the outreach or communications products that you have used, please rank their usefulness in your communication of the report? n=111

As the process for developing report key messages was designed in a more bottom-up style, Q68 focused on how effective this process had been (**Figure 11**). Over 80% of responses (n=115) stated that the process was helpful to provide the talking points, well-timed for the report launch and effective in developing clear, impactful messages. Additional comments, in an open-ended section to this question, included authors suggesting earlier engagement in the process and longer timelines would have been helpful.

When asked to provide any other comments regarding outreach and communications documents²³, responses included:

- Appreciation for the available resources;
- Interest in more communications products to be used by authors in sharing the report. Such as more slides for authors to use e.g. chapter slides, more videos to be produced;
- Interest in more support coordinating outreach events. Clear processes for getting secretariat involved could be useful, as well as support in additional languages;
- Conflicting comments with some saying there was too much material in the messaging and hot topics, and others saying there was not enough;
- Some questions about how to use these materials (wanting more detailed guidelines).

²³ Q71 Do you have any additional comments or suggestions related to the outreach and communications material? n=

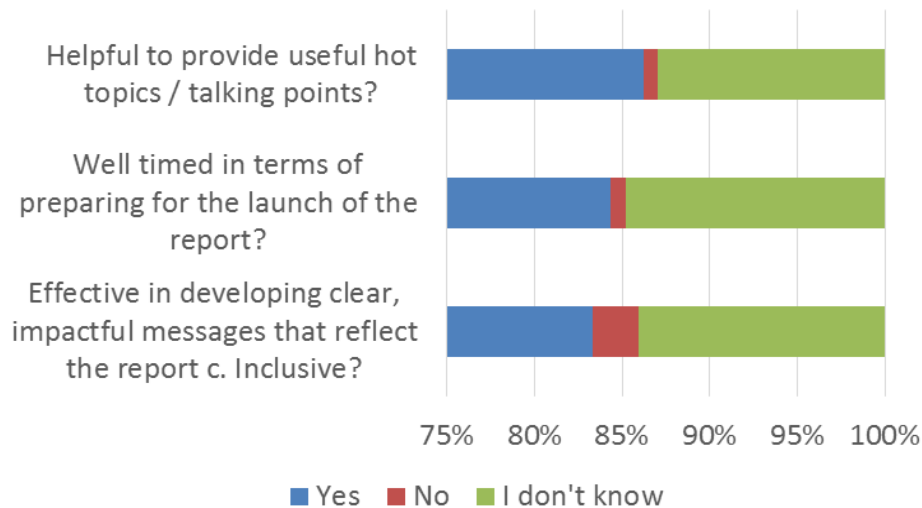


Figure 11: Q68. The report key messages launched through the press conference and communication material were developed through two workshops and three surveys during March and April 2021. They were finalised with Bureau members and TSU and updated during the SPM approval. Please share your feedback about the message development process. Was the process: Helpful to provide useful hot topics / talking points? Well timed in terms of preparing for the launch of the report. Effective in developing clear, impactful messages that reflect the report content inclusive? n=115

Summary: Novel AR6 initiatives like the FAIR data practices, enhanced efforts in communication and outreach, and co-designing SPM visuals have seen clear benefits that enable the IPCC to more effectively and more transparently communicate the assessment’s key findings but they require additional resources, such as additional funding to bring in external expertise and internal support roles to facilitate the process. Over 40% of WGI authors said they were involved with and supported the FAIR data principles. Over 70% viewed the co-developed SPM figures as being successfully accessible, usable and clear. And the majority of survey responses found the available communication and outreach products useful.

The COVID-19 pandemic

When the COVID-19 pandemic hit at the beginning of 2020, all IPCC work went online and the WGI timeline was extended by three months²⁴. When asked how the pandemic affected their and their chapter’s contribution to the WGI process²⁵, responses ranged from not being so affected, for example, “*Not so much, I guess*” (LA, Asia) or “*It got boring*” (CLA, Europe) compared to being severely impacted, for example, “*The workload increased too much... There were days where I thought I wouldn’t be able to carry on [with IPCC work], especially answering the reviewers’ comments*” (LA, South America) or “*It strongly impacted our work.*”

²⁴ Decision was made after survey consultations were run with all authors, the wider-scientific community, and several WGI-related journal editors. Feedback on how estimates of delay due to the impacts of the pandemic were then used to adjust the WGI timeline accordingly.

²⁵ Q72: How did the COVID-19 pandemic affect your and your chapter’s contribution to the WGI process? n=115

Many authors were ill with COVID or had family members who were ill or died.” (CLA, Europe).

Some comments mentioned the impact of not having in-person meetings, for example, *“We were missing a lot [from] LAM4 which would have helped to coordinate with authors and other chapters.”* (CLA, Europe) but others noted that online meetings allowed for greater flexibility, for example, *“It is a pity that we did not have many chances to meet in person, however, the COVID-19 gave us more flexibility in fixing more regular online discussions.”* (LA, Asia). Several comments stated how managing these online meetings from different time zones was an extra strain, for example, *“With late night and middle of the night zoom [calls], I felt that my health went down significantly”* (CLA, South West Pacific).

Many comments focused on the increased workload both in magnitude and in duration, for example, *“The extension of [the] drafting period, with higher expectations on the report materials, affected our non-IPCC tasks. Many were exhausted.”* (LA, Asia), *“Overall, the workload through this extension and through the many requested remote meetings increased the overall workload that is already very high”* (CLA, Europe), and *“The combination of high workloads and stressed societal conditions was a huge burden on many, and it was clearly visible as people cracked from time to time from the resultant pressures”* (RE, South West Pacific).

There were conflicting comments about whether this impacted the resulting assessment, for example *“As a result, the final writing process was quite difficult, and the assessment surely suffered. We also lost coordination with other chapter teams”* (LA, Europe) versus *“The pandemic resulted in an extended period of time for finalizing the chapter/report, which I think greatly improved the results”* (LA, Europe) or *“We worked a lot more in total hours and the result got much better”* (CLA, South America).

Summary: COVID-19 was a huge amplifier to an already strained and pressured working environment. Although survey responses showed that individual experiences of the pandemic greatly differed, overall, the workload increased both in magnitude and in duration. The dedication of authors made finalising the assessment possible.

Lessons learned from virtual working

When asked if there were positives to switching to virtual working²⁶ 76% (n=122) responded with Yes. Examples of positives gained from the virtual working environment included:

- Saved time travelling and saved CO2
- Online calls allowed for greater participation (e.g., other working groups could attend)
- Online calls can be more "democratic" if run inclusively (e.g., raise hand function, chat function allowed for written contributions if authors felt less comfortable speaking)
- Recordings of calls allowed people to catch-up or rewatch discussions
- More meetings could be arranged, if needed
- Virtual approvals enabled stricter time management and slack aided coordination.

16% answered No to this question. Reasons for this included stating that in-person LAMs are more effective / still needed, for example, *“In-person meetings seem necessary”* (LA,

²⁶ Q73: Are there any positive experiences from switching to virtual working that could be implemented in future IPCC cycles? n=122

North America) or “*Virtual work will only function if people have met each other*” (CLA, South America). One response stated “*No, except for reducing the carbon footprint*” (LA, South America).

It should be noted with concern that developing country authors were *far* less likely to say yes to this question than developed country authors (ratio of 0.66 vs. 0.89 of yes/no). This was true even with a stronger threshold for statistical significance ($p < 0.01$ compared to 0.05). It should also be noted that it is hard to uncouple the COVID-19 virtual experience from potential non-pandemic virtual working in the future.

Authors were also asked to state their preferences for many aspects of the IPCC drafting process being virtual or in-person²⁷ (**Figure 12**). Lead author meetings and Chapter meetings were strongly preferred to be in-person. Training and coordination meetings such as for FAQs and Glossary terms had a greater preference to be online.

²⁷ Q74: What aspects of the Lead Author Meetings (LAMs) would you prioritise as either in person or as virtual activities? n=126

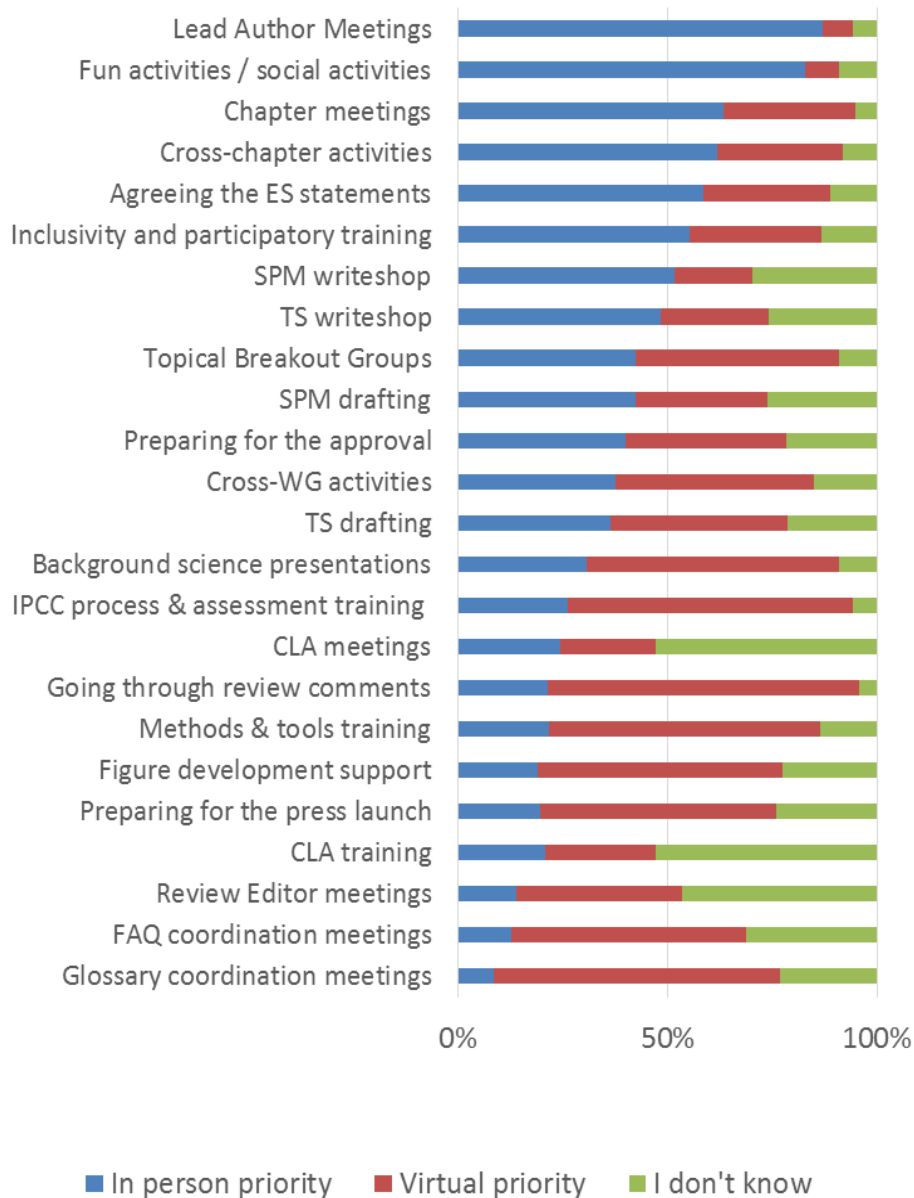


Figure 12: Q74: What aspects of the Lead Author Meetings (LAMs) would you prioritise as either **in person** or as **virtual** activities? n=126

Statistical analysis found several categories with significant differences ($p < 0.05$) between the different groups of respondents:

- Cross-Working Group Activities
 - Developing country authors prioritised to be in person but developed country authors prioritised virtually.
 - Regional chapter authors prioritised to be in person but Global and Process chapter authors prioritised virtually,
- Topical Break-Out-Groups:
 - CLAs prioritised to be virtual but LAs prioritised this to be in-person.
 - Authors new to AR6 prioritised to be virtual but authors involved with previous cycles prioritised this to be in-person.

- SPM authors prioritised to be virtual but non-SPM authors prioritised this to be in-person.
- CLA Training: Developing country authors prioritised to be in person but developed country authors prioritised virtually.

These results imply that Authors with possibly greater barriers to online participation can prefer in-person activities over virtual activities. In addition, authors who have more of an oversight / broader role (e.g., SPM authors or CLAs) seem to prefer a virtual format for activities that are more interconnected (e.g., cross-Working Group or break out groups activities) than authors whose role does not require a broader overview of the report during the drafting process. Perhaps this implies that authors who are less familiar with report topics outside of their individual expertise prefer these discussions to be in-person.

Summary: Overall, positive lessons learned from virtual working should be taken with caution. Developing country authors were statistically far less likely to state that there are positives to virtual working than developed country authors.

The listed positives that authors took from switching to virtual working included travelling time and CO₂ saved, online calls (if inclusively facilitated) could be more effective for those attending them, recording meetings allowed people to catch-up or rewatch discussions, and the scheduling of meetings / the people attending was more flexible than in in-person LAMs.

Future organisers of IPCC meetings should be mindful that this survey analysis showed that people who are less familiar with the report content or have greater barriers to participation statistically would have a preference for activities to be in-person rather than in a virtual format.

The authors' experience

Signing up to be an IPCC author is a multi-year commitment where there are many periods of extreme workload. An author is selected and placed in a chapter with colleagues from all over the world, many of whom they will not be acquainted with. With this in mind and after experiencing this whole process, the survey asked what aspects of their chapter's assessment authors were most proud of and are there aspects of your chapter's assessment that you would have done differently²⁸? 117 (77%) replied to describe what they were most proud of and 93 (61%) replied with insights into things they would have done differently. Word clouds that isolate common words and phrases from these responses are shown in **Figure 13**.

²⁸ Q34: What aspects of your chapter assessment are you most proud of? n=117. Q35 With hindsight, are there any aspects of your chapter's assessment that you would have done differently? n=93

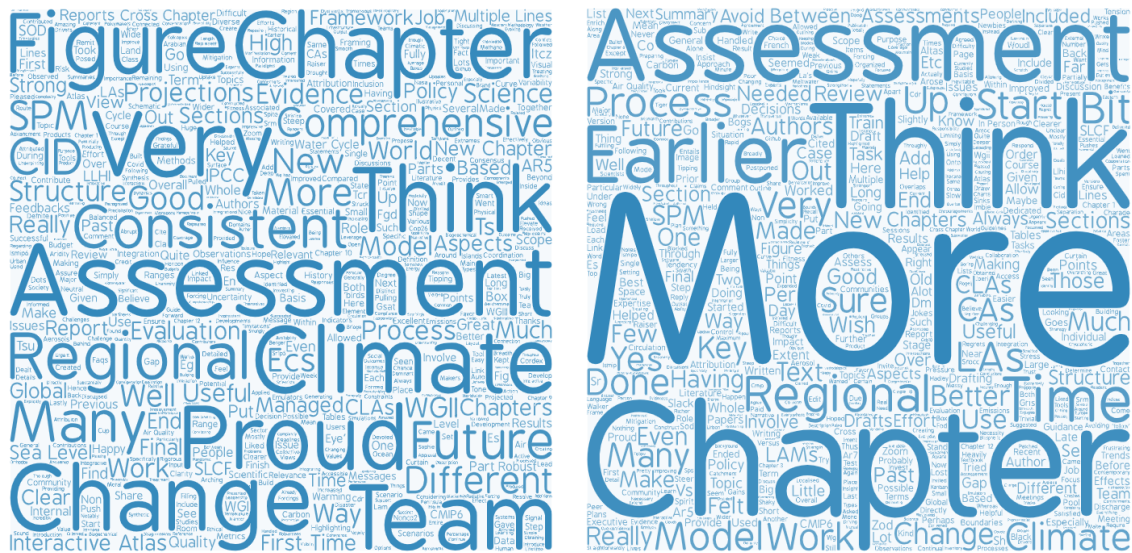


Figure 13: Word clouds generated from the Q34 What aspects of your chapter assessment are you most proud of? n=117 (left) and Q35 With hindsight, are there any aspects of your chapter's assessment that you would have done differently? n=93 (right). Size of font represents the number of times the word/phrase was mentioned in the responses.

Reasons to be proud

Of the response to what authors were most proud of, there were many individual comments on specific topics or sections or figures that they were happy to have included in the chapter, but several common themes across the responses could also be identified. One such theme was that of enhanced integration and robustness of the assessment results, for example, “Clearer evaluation of human influence across multiple lines of evidence compared to previous assessments” (LA, Europe) and “Robust assessment of radiative forcing, climate feedbacks, and mostly a synthetic assessment of ECS and TCR with their likely ranges much narrowed than the previous Reports” (LA, Asia). The comprehensiveness of some assessments were also noted, “Comprehensive / rigorous literature assessment as evidence for key global indicators” (LA, South West Pacific). Several responses touched upon the usefulness or relevance of the chapters either for policy or for the scientific community, for example, “Our chapter distilled some very simple messages that were subsequently taken up in the SPM and even at COP26” (LA, Europe).

A theme of creating something novel and useful was also stated in multiple comments. Chapters 6, 8, 10, 12 and the Atlas were all called out as being new chapters, which brought extra challenges but authors were happy with the result, for example, “This is a new chapter (8), a totally process-oriented chapter that will be very useful. I am proud of that!” (LA, Europe) and “The first time we have a homogeneous regional assessment of all Climatic Impact Drivers (CIDs)” (CLA, Europe). Many responses express pride in having a more thorough regional assessment compared to AR5. The development of the online Interactive Atlas was mentioned seven times. Other topics that were noted several times touched upon the increased robustness of the assessment, the integration of multiple lines of evidence, and bringing and the added value from past reports, for example, “I think the smart incorporation of emulators, our management of Low Likelihood High Impact events (and the fact that it wasn't struck during approval!), and the reproducibility of figures through the github repository are big successes” (CLA, Europe), “I am most proud of: 1) the multiple lines of evidence approach to the assessment of climate sensitivity; 2) the cross-chapter

assessment of the sea level and energy budgets” (LA, Europe) and *“We provided a thorough assessment of a topic that has seen major updates in scientific understanding since AR5. Quite proud of our efforts here”* (LA, North America).

Finally, some responses touched on the fact the chapter was able to be completed or touched upon the team-related aspects of the IPCC experience, for example, *“That we finished it”* (RE, South West Pacific), *“The clarity of the assessment and the unanimity of all the LAs in producing it was something to be proud of”* (LA, Asia) and *“The team work and how we pulled it all together during the pandemic”* (LA, Europe).

Things to do differently

The responses to the question *With hindsight, are there any aspects of your chapter’s assessment that you would have done differently?* Could be divided into two themes: responses on process including chapter dynamics, and responses on content of the report. With respect to the first category, many responses talked about starting things earlier or making decisions earlier on to ensure a smoother process, for example, *“We needed earlier and continual access to the other chapters”* (LA, South West Pacific) and *“Plan more carefully how to begin the process inclusively, and step by step process of building a chapter”* (LA, Europe). One comment stated *“Would have started writing only after the publication of the SROCC”* (LA, Europe) as the drafting in parallel with the special report caused consistency and overlap issues.

Several comments expressed the wish to have improved chapter team dynamics to aid the assessment, for example, *“I also think there was a tension between the authors (LAs) being able to make decisions about their sections, vs. the CLAs making overarching decisions ... I feel this situation could have been handled more straightforwardly”* (LA, North America) and *“Yes, we should have involved much more our CAs”* (LA, North America) and *“I would have further tried to foster a more collaboration approach on mono-disciplinary topics to further enrich... the assessment”* (LA, Europe).

Responses that were linked to scientific content included the wish for more time to be able to assess more topics, or assess some topics more thoroughly, for example, *“CMIP6 model evaluation was done in-house, so is not as deep as it could have been with more time. Paleoclines of evidence would need dedicated review papers to be properly integrated in model evaluation”* (LA, Europe).

Some responses noted topics that should have been assessed more but didn’t fit well in the report structure, for example, *“It might be better to have more stress on the near term and regional aspects as a stand-alone chapter - yes it was highlighted in current structure but would even integrate it more into one place”* (LA, Europe) and *“Some topics did not find a natural place (or could have gone in too many places), so ended up not being covered, even though they have important implications. Model evaluation of clouds is a good example of that”* (LA, Europe).

Another theme in the responses was on presenting the assessment. Comments touched upon wishing certain topics or executive summary statements were presented more clearly or in a more policy-relevant style, or the chapter was reordered to highlight topics more clearly, for example, *“I think we should have had a tipping points/LLHI section. I would also have reorganised sections slightly”* (CLA, Europe), *“I’d try (for all chapters) use an even easier language for the executive summary and the SPM”* (LA, South America), *“Gaps and Opportunities section could have been much better developed, but guidance was not strong on this point and it got postponed and postponed...”* (LA, North America) and *Cross-Chapter*

Box 10.4 should have been on mountain climate, not only Hindukush. I wish we could have had a cross Working Group Box on urban climate” (CLA, South America).

Finally, several comments simply responded ‘No’ or something similar to that effect, for example, *“Not really. Of course, things can always be improved... As scientists we are never 100 % satisfied with our work, but I have no particular regrets with our chapter” (LA, South America).*

Summary: Despite several suggestions on how to do things differently, authors stated many reasons they were proud of what they had achieved. Creating a report with enhanced integration and a robust assessment, creating something novel and useful, teamwork-related aspects of the IPCC experience, and the fact the chapter was able to be completed under difficult circumstances were themes from the survey responses relating to what authors were most proud of in their chapter assessment. Suggestions for how to improve the process including chapter dynamics and how to improve the content of parts of the report were stated in the responses on what authors would have done differently. Some authors simply responded that they would not have done anything differently.

Guidance and training

Two questions in the survey touched upon what guidance and training are useful for authors to do their assessment²⁹. Both questions had many overlaps in their responses and so were analysed together. The training / guidance documents that were offered and appreciated by authors fell into roughly three categories: guidance on how to do the assessment, training on the supportive tools available, and facilitation and team-building training. All themes also received comments saying these types of training could have been strengthened.

Aspects related to how to do the assessment included the uncertainty language, including deep uncertainty and statements of fact, understanding what is policy relevant / how IPCC reports are used, what are the expectations at what stage of the process, conducting systematic reviews, choosing which papers to cite, and how to distil the key messages. For example, *“An internal note on the difference between IPCC style writing and research paper-writing style would be helpful for new authors, with plenty of examples” (LA, South West Pacific)* and *“Throughout the process, I struggled with the assessment statements. Because of their importance, it was almost petrifying to commit to a statement” (LA, Europe).*

There were several comments asking for earlier training on figure plotting development, (including representing model uncertainty on maps) and the Figure Manager, as well as the FAIR data requirements and how to coordinate replying to review comments. For example, *“I wish we had a set of modern tools for online collaboration that we were trained on early in the process. I also wish best practices for data and figures were made part of this, rather than coming in the end in a rush” (LA, North America).* The final theme from the responses touched upon guidance around team management, cross-chapter coordination, facilitation and mediation training, or how to encourage quieter authors to contribute more. For example, *“I wish CLAs had received training on how to chair on & offline meetings, prior to starting the role” (LA, Europe).*

²⁹Q19: In your view, were there any methodological guidance notes that WGI should have prepared before the report drafting began? n=84, Q75: In hindsight, what training do you wish you had received during your IPCC experience and when would that have been best in the timeline? n=51

Although training on these topics was organised at certain points during the process, the support on these themes can always be strengthened. Most responses focused on suggesting topics for training rather than when this training occurred but suggestions mainly included starting earlier in the process. A couple of comments warned that having so many guidelines can feel overwhelming and the messages can be unintentionally lost. This point was proven when looking at the responses of Q75, where several suggestions for guidelines and training were on topics where guidelines already existed. Additionally, one comment suggested having a pre-LAM type meeting before LAM1 focused solely on training and one comment also suggested training should be more interactive, rather than just a webinar or reading a guidance document.

Suggested new topics for training/guidance that was not previously been offered included analysis training, such as using multi-model analysis, assessing model significance, quantifiably assessing from multiple lines of evidence, and also scientific knowledge training, such as scientific research webinars to help authors broaden their horizons early on in the process.

Summary: The offered training and guidance documents to support authors in their assessment was appreciated but earlier guidance and training on the process and the expectations for doing the assessment was needed. Appreciated training fell into three categories: guidance on how to do the assessment, training on the supportive tools available, and facilitation and team-building training. All themes received comments saying these types of training could have been strengthened. Suggested new activities for further training/learning in future assessment cycles included analysis/methodological training and scientific research webinars to help broaden perspectives early on in the process.

Other themes that emerged from the responses

In a survey that contains many open-ended questions, it was possible to identify some themes emerging from the responses that were not explicitly asked about in the questions but seem necessary to comment on in this report. Three such themes are discussed below. Some have been touched upon already in the quotes stated in earlier sections of the report but some are in addition.

Theme 1: Author drop-off

Being an IPCC author is a multi-year commitment. Authors were selected in January 2018, attended their first author meeting in June 2018, and, for those involved with the SPM, would have officially worked until the approval, which was held in August 2021. In reality many authors continue to check the report during the production phase of the process, which finished in July 2022. With such a long commitment in mind, it may seem natural that some individuals would not be able to contribute to the full length of this process. An example from the survey responses to Q36, Do you have anything else to add in the context of your chapter assessment?, touches upon this issue: *“I realise this probably happens in all chapters to some extent, but it was disappointing that a couple of LAs stopped engaging in the middle of the process. It would be useful to learn more about why some authors ‘disappear’ - it certainly adds to the workload of the other authors (and particularly the CLAs)”* (CLA, Europe).

Reasons for why some authors drop out can only really be speculated here, as the ones who no longer contribute to the report are probably the ones who also do not complete this

survey (there was an overall 65% response rate to the survey). As AR6 occurred during the COVID-19 pandemic then this undoubtedly impacted authors' contribution. If some authors were experiencing the death of loved ones, then voluntarily contributing to an assessment report would have been very low on their priority list. Other reasons for dropping off could be: over commitment of time with other projects/responsibilities, change of institution or role, change of personal situation, not feeling your contribution is welcome or being valued, or other barriers to participation (see Theme 3).

The IPCC has a practice to replace non-contributing authors, usually with authors who have similar expertise from the same WMO region, but there is little past practice of what to do with authors who 'disappear' part way through the process or who only very minimally contribute (for whatever reason). Contributions, no matter how small, should always be recognised but the imbalance of workloads can increase throughout the cycle, especially impacting those authors who contribute for the whole of the process and must take on more responsibility as a result. If an author is unable to continue their contribution throughout the report for whatever reason, then perhaps a process needs to be established to elevate further support into that chapter's team (e.g., elevating some CAs to LA roles) but still recognises the contribution of those who are no longer active.

Theme 2: Ethics of authorship and recognition

As indicated in the section before, there is often an unequal distribution of workload across authors in the report-writing process. If there is not enough support coming from the core chapter team then additional support must be incorporated. This is usually done through the roles of Contributing Authors and Chapter Scientists. In exceptional cases, new LAs can be incorporated into chapter teams if large gaps in expertise are identified early on in the process. Unfortunately, the survey had no specific questions aimed at either of the Contributing Author and Chapter Scientist roles³⁰ but Chapter Scientist (or CSs) were mentioned 35 times in all responses, and Contribution authors (or CAs) were mentioned 29 times. Contributions from both CAs and CSs were undoubtedly appreciated in the survey responses and some responses suggesting asking more of these roles in future assessments, for example:

Contributing Authors

- Do you think it is important to make remote/server-side analysis tools available to authors for future assessments? *"We relied heavily on CAs for figure development"* (CLA, North America)
- Do you have any recommendations on how to effectively deal with the increasing volume of available literature when undertaking an assessment? *"The inclusion of a large number of CAs helped, but I have to confess that some training on systematic automatic reviews would have been very helpful"* (CLA, Europe)
- With hindsight, are there any aspects of your chapter's assessment that you would have done differently? *"Yes, we should have involved much more our CAs"* (LA, North America)

Chapter Scientists

- Do you have any recommendations on how to effectively deal with the increasing volume of available literature when undertaking an assessment? *"Increase the Chapter support through Chapter scientists that review the literature and prepare overviews/summaries of relevant publications for particular chapters"* (LA, Europe).

³⁰ A survey that focuses specifically on the role of the Chapter Scientist was sent to complement the authors' survey. See <https://zenodo.org/record/7576668#.Y9jz0ISZM2w>.

- Do you have anything else to add in the context of your chapter assessment? *“Chapter scientists were extremely valuable”* (LA, South West Pacific).
- If you were a CLA, do you have anything to add that is specific to your role? *“Our two chapter scientists were extremely helpful, I don’t think we could have done it without them. Funding needs to be acquired for these chapter scientists for future reports.”* (CLA, Europe).
- Do you have any suggestions to improve the efficiency and efficacy of the FOD and SOD review process? *“I think it was as smooth as it could be (greatly helped by support from the TSU and excellent chapter scientists)”* (CLA, Europe).

There are rough guidelines on the role of Contributing Authors in the IPCC Procedures Appendix A³¹ but no formal guidelines for Chapter Scientists. In the AR6, efforts were made in the TSUs to develop Terms of Reference (TORs) but these would need to be edited and formalised, particularly given response from the WGI Chapter Scientist debrief survey³².

WGI tried to enforce that if a CS went beyond their TORs then they should be listed as a CA, but if a contribution goes beyond that of a CA, should those individuals be further recognised? Only CLAs, LAs and REs are included in the official citations for the IPCC reports. Including additional names into the chapter citation becomes difficult because one of the priorities that the IPCC strives for is regional balance between author teams, and any additions to these teams should be mindful of creating further imbalances. In WGI, this is a great challenge as the scientific community remains largely imbalanced across geographical regions. The regional breakdown of WGI AR6 CAs is even more unbalanced than the equivalent breakdown from selected authors, for example, African CAs make up only 2% of all WGI CAs (a difference of -7% compared to the percentage of African authors in the WGI AR6) whereas European CAs make up 53% of all WGI CAs (a difference of +14% from the compared to the percentage of European authors in the WGI AR6)³³.

The top 10 most popular CA countries were: USA (105), UK (79), Germany (62), France (47), Australia (33), Spain (27), China (26), Canada (18), Switzerland (16) and the Netherlands (15). China and Brazil were the most popular developing countries from which CAs were based with 26 and 9 contributions, respectively. If a small percentage of these CAs were to be recognised as Lead Authors then this would imbalance the regional diversity even more across the report. However, if these CAs have contributed far beyond the expected contribution of a CA, then shouldn’t their contribution be recognised? The debate around ethics of authorship and recognising contribution must be met with efforts to include diversity and truly have a globally representative assessment as much as possible. The responsibility for recruiting CAs must include greater efforts to have regional representation.

Theme 3: Inclusive practices and barriers to participation

As stated in the introduction, the WGI focused on providing inclusive practice and unconscious bias guidance and training during the AR6. This commenced at the second Lead Author Meeting and was arranged by SHIFT Collaborative. In addition to this author’s survey, a complimentary survey was run (after this survey had closed) that focused entirely on inclusive practices, unconscious biases, and barriers to participation. Despite knowing that another survey on these topics would be available, many questions included responses

³¹ <https://www.ipcc.ch/site/assets/uploads/2018/09/ipcc-principles-appendix-a-final.pdf>

³² <https://zenodo.org/record/7576668#.Y9jz0ISZM2w>

³³ Full regional distribution across CAs compared with their regional percentage of selected Authors and Review Editors are: Africa (2%, -7%), Asia (12%, -9%) Europe (53%, +14%), North America, Central America & Caribbean (21%, +6%), South America (4%, -4%), South West Pacific (8%, -1%).

that touched upon these themes. A list of examples is shown below. Note that most of the responses that touched upon these topics (not all shown here) come from European authors. Responses covered a variety of non-inclusive practices that caused barriers to some author's participation.

- Q41 For which topics were there barriers to, or insufficient coordination across chapters and why do you think that was the case? *“Coordination of the assessment of droughts was very difficult because the process was not collaborative or inclusive and in part dominated by big egos”* (CLA, Europe)
- Q61 Do you have any suggestions for improving the SPM drafting process? *“This was heavily dominated by Western European voices, and excluded other perspectives”* (LA, South West Pacific).
- Q75 In hindsight, what training do you wish you had received during your IPCC experience and when would that have been best in the timeline? *“How to run an effective and inclusive meeting; what are the step-by-step processes to go through in building up a chapter skeleton and how to then begin delegating and populating”* (LA, Europe)
- Q80 Is there anything else you would like to say? *“It has been a great intense experience during which I learned a lot, but I realized there are still many barriers that need to be broken down like gender, age and nationality. The WGI AR6 environment has been very explicit to imply that being older doesn't always mean to be right. Being a woman doesn't always mean to be less smart. Being from a developing country doesn't always mean to count half”* (LA, Europe).

Running meetings in a non-inclusive manner or having others dominate the conversation are only a couple of examples of many barriers to participation that authors can face in the IPCC. The more barriers to participation someone faces, the less likely they are able to participate. These barriers can and have stopped some authors from fully contributing. Although unconscious bias and inclusivity training had not been run in IPCC meetings before, the activities conducted and the feedback collected shows the need to further develop these practices. This will be covered in much more detail in the two SHIFT reports designed to complement the lessons learned and recommendations being developed by the WGI Bureau and TSU after the end of the AR6 cycle.

Theme 4: The role of the Bureau and TSU to guide, coordinate, facilitate and mediate

Several responses from multiple questions expressed appreciation or positive feedback on the role that Bureau and TSU members played in steering and facilitating the progress of the report. Examples are listed below that indicate that the Bureau and TSU can play a vital support role throughout the processes to facilitate and catalyse decisions, and mediate or offer support in issues of disagreement.

- Q41 Which topics do you think were successfully coordinated across chapters and why?
 - *“Scenarios and their use in WGI. Early engagement of relevant actors and strong support from one of the WGI Vice Chairs”* (LA, Europe).
 - *“Bureau/TSU facilitation was very effective and eased over potential tension”* (CLA, Europe)
 - *“Bureau and TSU facilitated and moderated call were extremely successful”* (CLA, South West Pacific)
 - *“Bureau facilitated calls in-between LAMs”* (CLA, North America).

- *“I had the impression that when there was a central coordination from TSU and Bureau authors tends to respond but when it was left to the authors to organize among themselves it didn't always work efficiently”* (LA, Europe)
- Q32 *If you were a CLA, do you have anything to add that is specific to your role? “I was surprised how much of my effort went into team building... I felt strongly supported by my fellow CLAs, the Bureau, and the TSU, but this was still a challenge”* (CLA, North America)
- Q80 *Is there anything else you would like to say? “I think the AR6 WGI process was extremely well coordinated thanks to the Bureau and TSU.”* (CLA, Asia) and *“A very very big thank you to the TSU and IPCC WGI Bureau. What a huge job to guide such a large scientific endeavour during such challenging times, and get us there in the end.”* (RE, South West Pacific).

Summary: Other themes that emerged from the survey responses despite not having dedicated questions on these topics included authors dropping-out or no-longer being able to contribute during the process, ethics of authorship and recognition, and inclusive practices, unconscious biases and barriers to participation.

Reasons for why some authors do not contribute for the full length of the process can only really be speculated here, as the ones who no longer contribute to the report are probably the ones who also do not complete this survey. The COVID-19 pandemic undoubtedly impacted some authors' contribution more than a 'usual' IPCC cycle.

There is an unequal distribution of workload across authors in the report-writing process. Contributions, no matter how small, should always be recognised but author drop-off increases the imbalance of workloads in an author team, causing remaining authors to take on even more responsibility as a result.

The contributions from both CAs and CSs were undoubtedly appreciated in the survey responses and their contributions should be appropriately reflected. The debate around ethics of authorship and recognising contribution must be met with efforts to include diversity and truly have a globally representative assessment as much as possible. The responsibility for recruiting CAs must include greater efforts to have regional representation.

The survey responses included a variety of examples of non-inclusive behaviours that caused barriers to some author's participation. Although the inclusive practice training supplied to authors seemed to be appreciated overall, this training needs to go further to ensure that all individuals become mindful of unconscious biases and exclusive behaviours.

The Bureau and TSU can play a vital role to guide, coordinate, facilitate and mediate discussions throughout the entire report process.

ANNEXES

Annex I: List of the survey questions analysed in this report

Participant Information

1. What was your role?

CLA

LA

RE

2. Did you have any of the following other roles? Tick all that apply

TS author

TS section lead

SPM author

SPM headline statement lead

SPM figure team

3. In which chapter were you based?

1

2

3

4

5

6

7

8

9

10

11

12

Atlas

4. What is your nationality?

Please list any other nationalities

5. What is your gender?

Female

Male

Other

Prefer not to say

6. What are your working languages?

7. Have you been a CLA, LA or RE in previous IPCC cycles?

Yes
No

Considerations related to the report structure

8. In your view, was the report structure well suited for the assessment of the physical basis of climate change?

Not at all
A little
A moderate amount
A lot
Completely
I don't know

9. What were the strengths and weaknesses of the WGI AR6 structure?

10. How should the WGI report structure be modified for the next assessment cycle?

Revert to a more AR5 style where the structure is organised around specific lines of evidence (obs, paleo, model etc)
Remain approximately the same
Integrate further to be more interdisciplinary
I don't know

Please explain your choice

11. It was recommended that each section's assessment use the Special Reports (or AR5 if not applicable) as a starting point. How easy was it for your assessment to build on from the Special Report assessment results?

Very easy
Easy
Neither easy nor difficult
Difficult
Very difficult
I don't know

Any Comments:

Considerations related to the chapter assessment

Aspects related to the literature assessment

12. Did you make use of the UNEP library resources to access literature?

Yes
No
I don't know

Any comments on increasing the usefulness of this resource?

13. Did you undertake a systematic literature review? Systematic reviews are a type of review that uses repeatable analytical methods to collect secondary data and analyse it.

Yes

No

I don't know

If yes, how did you set this up?

14. Do you have any recommendations on how to effectively deal with the increasing volume of available literature when undertaking an assessment?

15. Was non-English literature assessed in your chapter?

Yes

No

I don't know

If yes, which languages? If not, what was the reason for not assessing non-English literature?

16. Do you have any suggestions to improve the diversity (language and geographical origin) of literature that is assessed and cited in future assessments?

17. Several community review papers were published in the early drafting stages of the WGI timeline, were these reviews helpful as a starting point drafting your chapter?

Yes

No

I don't know

18. Should more community-based reviews be done for AR7? If yes, on what topics?

Yes

No

I don't know

Suggested topics:

19. In your view, were there any methodological guidance notes that WGI should have prepared before the report drafting began? Past examples include the Guidance Note on Consistent Treatment of Uncertainties and the recommendations from the Expert meeting on Regions held in 2018. Please specify on which topics.

Aspects related to the report review process

20. The interim draft (prior to the FOD) went for internal review to invited experts. How helpful was the preparation and review of the interim draft?

Not at all helpful

Not so helpful

Somewhat helpful

Very helpful

Extremely helpful

I don't know

Any comments on how to improve the usefulness of interim draft in the report drafting process?

21. Do you have any suggestions to improve the efficiency and efficacy of the FOD and SOD review process?

22. Do you think more community-driven group reviews on the FOD and SOD would benefit the drafting process? If yes, on what topics?

Yes

No

I don't know

Suggested topics

23. If your chapter was reviewed by some of the Early Career Scientists group review, how helpful were those comments compared to individual reviews?

Not at all helpful

Not so helpful

Somewhat helpful

Very helpful

Extremely helpful

I don't know

Any comment

24. All review comments require an appropriate response. Do you have any recommendations to improve the efficiency of responding to and checking review comments?

Chapter figures

25. To what extent did the guidance provided for chapter figure development, including the Style Guide and training, strengthen your final set of chapter figures?

Didn't strengthen

Somewhat strengthened

Really strengthened

I didn't use the Style Guide / attend the training

I don't know

26. If you didn't use the guidance resources, why was this?

I didn't find it useful

I didn't know it existed

Not enough time to implement the guidance

I don't know

Other (please specify)

27. In which way was the Figure Manager useful for you? (tick all that apply)
- Searching for information related to other figures than your own
 - Efficient way to exchange files and information within your Chapter team, with the TSU
 - Useful for the development of figures
 - Useful to have an overview of your chapter visuals
 - Useful to keep track of different versions and updates
 - I didn't use Figure Manager
 - Other (please specify)

Data aspects

28. Did you use any of the following compute services for the analysis of model output? (Yes, No, I don't know)
- Obs4MIPS
 - ESMValTool
 - input4MIPs
 - Remote/server-side analysis platforms (e.g. on data servers like Jasmin)
 - Other (please specify)

29. Do you think it is important to make remote/server-side analysis tools available to authors for future assessments? (Yes, No, I don't know)
- Please share any views and suggestions

30. The implementation of FAIR data principles was recommended. Did you make or were you involved with preparing any of the following: (Yes, No, I don't know)
- Code underlying figures available
 - Data underlying figures available
 - Data tables for figures

31. Do you have any other comments on the implementation of FAIR data principles as part of the report preparation?

Your Chapter in General

Questions 34-36 are on resulting outputs, rather than the drafting process.

32. If you were a CLA, do you have anything to add that is specific to your role?
33. If you were a RE, do you have anything to add that is specific to your role?
34. What aspects of your chapter assessment are you most proud of?
35. With hindsight, are there any aspects of your chapter's assessment that you would have done differently?

36. Do you have anything else to add in the context of your chapter assessment?

Considerations related to the use of CMIP

37. On CMIP6 data distribution and access, please describe what went well, what went not-so-well, and indicate suggestions for improvement.

- Well
- Not-so-well
- Suggestions

38. How important is it for the latest CMIP phase to be aligned with the IPCC? (Should CMIP7 be prioritized for release before the AR7 cycle begins?)

- Not at all important
- Not so important
- Somewhat important
- Very important
- Extremely important

Please provide any further relevant details

39. What would you prioritise for CMIP7 in the context of the future assessment of the physical basis of climate change?

Coordination needs across Chapters and Working Groups

40. Which topics do you think were successfully coordinated across chapters and why? Example mechanisms include LAM BOGs, Bureau or TSU facilitated calls in between LAMs, author-led calls, cross-chapter boxes, cross-chapter teams etc)

41. For which topics were there barriers to, or insufficient coordination across chapters and why do you think that was the case?

42. Do you have any recommendations for improved links and coordination across chapters?

43. Which topics were successfully coordinated across Working Groups and why? Example mechanisms include LAM BOGs, Bureau or TSU facilitated calls in between LAMs, author-led calls, cross-WG boxes, cross-WG teams etc.

44. For which topics were there barriers to, or insufficient coordination across Working Groups and why do you think that was the case?

45. Do you have any recommendations for improved links and coordination across Working Groups?

Considerations related to the Frequently Asked Questions (FAQs)

46. To what extent did the co-development process between the authors, the TSU & the graphics designer strengthen the final FAQ product?

- Didn't strengthen
- Somewhat strengthened
- Really strengthened
- I don't know
- Any comment

47. If you were an FAQ author - What was for you the most challenging part of the drafting process?

- Choosing the FAQ topics
- The figure
- Keeping the text short
- Keeping the FAQ accessible, yet scientifically correct
- The co-development process with the TSU & design team
- I don't know
- Other (please specify)

48. Do you have any suggestions for improving the FAQ drafting process?

Considerations related to the Glossary

49. Each chapter had at least one author allocated as a glossary contact. How did your chapter work on drafting glossary terms?

50. To what extent were the following aspects of the glossary drafting process effective? (Not at all effective, Not so effective, Somewhat effective, Very effective, Extremely effective, I don't know)

- Using the Collaborative Online Glossary System (COGs)
- Cross-chapter coordination
- Cross-WG coordination
- The timeline
- Prioritisation of chosen terms

51. What part of the glossary drafting process could have been improved?

Considerations related to the Technical Summary

Questions 52-54 are on resulting outputs, rather than the drafting process.

52. How effective was the Technical Summary in the following aspects?

Not at all successful, Not so successful, Somewhat successful, Very successful, Extremely successful, I don't know)

- A good starting point for drafting the SPM
- Being a useful standalone document with added value to the chapters and SPM

Being written in accessible, user friendly language
Enhancing cross chapter coordination
Highlighting how conclusions have evolved over time / past assessments
Highlighting new findings
Integrating findings across chapters
Providing a clear line of sight to the chapter assessments
Underpinning a concise SPM

53. The aim was to include figures in the TS that summarised findings across chapters while being accessible for technical but non-expert audiences. How successful was this approach?

Not at all successful
Not so successful
Somewhat successful
Very successful
Extremely successful
I don't know

54. Any further remarks regarding the TS figures?

55. Do you have any suggestions for improving the TS drafting process?

Considerations related to the Summary for Policymakers

Questions 62-64 are on resulting outputs, rather than the drafting process.

56. A bottom-up process was implemented to start drafting the SPM aimed at identifying the key findings from across the chapters. To what extent do you agree that the initial bottom-up drafting process strengthened the resulting SPM product?

Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree
I don't know

57. The second drafting phase of the SPM was directly linked to the Technical Summary for line of sight to the report. To what extent do you agree that this second stage strengthened the drafting of integrated SPM statements?

Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree
I don't know

58. How useful were the internal reviews of the SPM in developing a robust and impactful document?

Not at all useful
Not so useful
Somewhat useful
Very useful
Extremely useful
I don't know

59. How useful were the governmental reviews of the SPM in developing a robust and impactful document?

Not at all useful
Not so useful
Somewhat useful
Very useful
Extremely useful

60. Is there anything in the SPM figures co-design process that could be improved? (tick all that apply)

Understanding the design tools in place (intent, peak of the story, etc.)
Development of text and figures not synced
Author team dynamics
Interaction between authors and TSU design team
Bottom-up approach
Inclusivity
None of the above

Any suggestions for improvement?

61. Do you have any suggestions for improving the SPM drafting process?

62. How successful is the Summary for Policymakers in the following aspects?

(Not at all successful, Not so successful, Somewhat successful, Very successful, Extremely successful, I don't know)

Summarise the key findings of the assessment
Provide a plain language narrative with the headline statements
Provide a clear visual narrative of report key findings
Highlight policy relevant information from the report

63. Information design and cognitive principles were combined with the expert assessment with the aim to make the SPM figures clearer, more understandable and more usable. How much do you think the SPM figures were:

(None at all, A little, A moderate amount, A lot, A great deal, I don't know)

Clear (convey a clear message of the synthesis and conclusions)
Usable (for multiple outreach contexts)
Accessible (reaching a broad audience)
Any Comment

64. In your view, how balanced is the SPM narrative in terms of the text and visual aspects?

Unbalanced - too text heavy
Balanced
Unbalanced - too figure heavy
Any Comment

Considerations related to Communications

Questions 70-71 are on resulting outputs, rather than the drafting process.

65. Media Training was organised at LAM3 and from December 2020 through to the approval of the SPM and included two training sessions during the approval and a workshop later in August 2021. Did you attend media training sessions? (check all that apply)

Webinars/workshops
1 on 1 training with Sue Escott (virtual)
1 on 1 training with Sue Escott (in person - LAM3)
I did not participate in any training

66. In which aspects was the media training that you attended useful? (check all that are relevant)

The training increased my preparedness to conduct media interviews about the report
The training increased my confidence
The training did not advance my skills
Other (please specify)

67. Do you have any additional feedback or suggestions related to media training?

68. The report key messages launched through the press conference and communication material were developed through two workshops and three surveys during March and April 2021. They were finalised with Bureau members and TSU and updated during the SPM approval. Please share your feedback about the message development process. Was the process:

(Yes, No, I don't know)
Effective in developing clear, impactful messages that reflect the report c. Inclusive?
Well timed in terms of preparing for the launch of the report?
Helpful to provide useful hot topics / talking points?

69. Please feel free to provide more context and views, or suggestions for how this process could be improved.

70. For any of the outreach or communications products that you have used, please rank their usefulness in your communication of the report

(Not at all useful, Not so useful, Somewhat useful, Very useful, I don't know)

Key Messages
Hot Topics
Interview Checklist
Zoom Background

Press
Conference/Key
Message Slides
SPM figure slides
Translated slides
Regional Fact Sheets

71. Do you have any additional comments or suggestions related to the outreach and communications material?

Meetings and assessment activities, also in the context of the COVID-19 pandemic

72. How did the COVID-19 pandemic affect your and your chapter's contribution to the WGI process?

73. Are there any positive experiences from switching to virtual working that could be implemented in future IPCC cycles?

(Yes, No, I don't know)

Please explain your response

74. What aspects of the Lead Author Meetings (LAMs) would you prioritise as either in-person or as virtual activities?

(In person priority, Virtual priority, I don't know)

Agreeing the ES statements
Background science update presentations
Chapter meetings
CLA meetings
CLA training
Cross-chapter activities
Cross-WG activities
FAQ coordination meetings
Figure development support
Fun activities / social activities
Glossary coordination meetings
Going through review comments
Inclusivity and participatory training
Lead Author Meetings
Preparing for the approval
Preparing for the press launch
Review Editor meetings
SPM drafting
SPM writeshop
Topical Breakout Groups
Training on IPCC process and assessment, including the use of the calibrated language)
TS drafting

TS writeshop

TSU training on methods and tools (referencing, Figure Manager, DMS, data, figures etc.)

Other (please specify)

75. In hindsight, what training do you wish you had received during your IPCC experience and when would that have been best in the timeline?

Considerations for the next IPCC assessment

76. In how many years time should the next WGI report be released and why? (taking into account a report needs ~3 years to be drafted)

3

4

5

6

7

8

9

10

11

12

Please explain your answer

77. In your view, considering the science advances and knowledge gaps identified in your assessment, which science topics will be particularly policy relevant for the next assessment?

78. Do you have any suggestions for coordinated activities or mechanisms in the scientific community, including in your region, that would be particularly important for future assessments (for example, thematic working groups, analysis groups, discussion networks)?

Closing

79. If you would be interested in participating in follow up focused discussions related to the outcomes of the survey, then please leave your name below.

80. Is there anything else you would like to say?

Annex II: Survey questions where statistical significance tests were applied

- **Q8** In your view, was the report structure well suited for the assessment of the physical basis of climate change?
- **Q10** How should the WGI report structure be modified for the next assessment

cycle?

- **Q15** Was non-English literature assessed in your chapter?
- **Q17** Several community review papers were published in the early drafting stages of the WGI timeline, were these reviews helpful as a starting point drafting your chapter?
- **Q18** Should more community-based reviews be done for AR7? If yes, on what topics?
- **Q20** The interim draft (prior to the FOD) went for internal review to invited experts. How helpful was the preparation and review of the interim draft?
- **Q23** If your chapter was reviewed by some of the Early Career Scientists group review, how helpful were those comments compared to individual reviews?
- **Q38** How important is it for the latest CMIP phase to be aligned with the IPCC? (Should CMIP7 be prioritized for release before the AR7 cycle begins?)
- **Q52** How effective was the Technical Summary in the following aspects?
- **Q53** The aim was to include figures in the TS that summarised findings across chapters while being accessible for technical but non-expert audiences. How successful was this approach?
- **Q62** How successful is the Summary for Policymakers in the following aspects?
- **Q63** Information design and cognitive principles were combined with the expert assessment with the aim to make the SPM figures clearer, more understandable and more usable. How much do you think the SPM figures were:
- **Q73** Are there any positive experiences from switching to virtual working that could be implemented in future IPCC cycle
- **Q74** What aspects of the Lead Author Meetings (LAMs) would you prioritise as either in person or as virtual activities?

Overview of statistical significance testing on qualitative survey question responses

Colour codes: **Green** indicates a statistically significant difference (p-value under 0.05). **Dark green** has a p-value of under 0.01. **Red** indicates the groups that needed non-equal variance T-testing.

Binary questions were: Q15, Q17, Q18, Q73 (shown in *italics*).

Groups showing largest statistically significant differences were:

- Developed vs developing
- SPM vs nonSPM

Followed by:

- Male vs Female
- CLAs vs LAs / TS vs nonTS

Some Qs had no statistically significant differences, e.g., report structure suitability, whereas others had multiple group differences, e.g. if non-english literature was assessed, aligning CMIP with AR7.

Annex II Figure I shows an overview of these statistical significance tests.

