

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
50581	0	0	0	0	Overall, there are not many figures in this chapter. Perhaps it would be possible to include a figure summarizing key findings of WGI and WGII ("why do we need mitigation? Because of the future changed state of the climate, and the impacts of the change"). A figure presenting all the SDGs, with their name, could also be added.	The chapter has been revised and few a few more figures added. One of the figures reflects the SDG in some form	Anne Marie Treguier	CNRS	France
50607	0	0			Thanks for this very informative introductory chapter. I am an author from WGI chapter 1, and my comments are made from my WGI point of view. I am no expert on mitigation. Nevertheless, I hope these comments will be useful.	Thank you very much.	Anne Marie Treguier	CNRS	France
50609	0	0			Overall, the contents of the chapter seems to fit the approved WGIII outline. However, I would have expected a more visible treatment of uncertainty, with a full section or subsection devoted to it. The uncertainty language of IPCC should be introduced somewhere. I was also expecting more details on the operational tools used for the WGIII assessment: where does the data come from? Are there numerical models involved? If it is the case, how are they developed? are the numerical codes open, traceable? Are the data dealt with according to the FAIR principle? Is there a big problem because of proprietary, non publishable data, that may be an obstacle to the WGIII assessment? Finally, the approved WGIII outline says "strong link with Chapter 17", but chapter 17 is apparently cited only once in this chapter.	These are good points. We now refer to IPCC risk & uncertainty guidance, as well uncertainty in the impacts/aggregated appraisals. Issues of the tools and data are addressed in the Appendices (notably C) to which we cross-refer much more.	Anne Marie Treguier	CNRS	France
8945	0				This Chapter is of particular importance since it is going to be one of the most read parts of the entire IPCC Report. Therefore, it must be especially coherent and comprehensive, using the same narrative framework developed in the rest of the Report. Generally speaking, the Chapter is strongly biased toward an economy-based narrative, in which the role of technologies is dramatically overrated. This is reflected by the use of lexicon in the discourse: the words "economy/ies, economic, financial and finance/es" score 209 appearances (references excluded). "Investment/s" and "growth" add up 86 appearances, "energy" 105 and "technology/ies" 65. On the other hand, the word "ecology" is mentioned just 3 times, "biodiversity" 4 times and "environment" 9 times, whilst "emergency", "migration/s", "children", "hunger" are not mentioned whatsoever in the document. Even in the old narrative of the "three pillars of sustainability", this unbalancing between the social, environmental and economic dimensions is striking. The systemic intertwined network of mutual effects and feedbacks that ultimately drives the global changes and evolution is neglected. Focal systemic features, like for example that represented by the causal loop diagram of the global risks published each year by the World Economic Forum, are very poorly addressed (Global Risks Interconnections map 2020, Fig. IV, https://reports.weforum.org/global-risks-report-2020/).	The chapter has been revised and there is a section on sustainable development which explores the interaction between climate action and other societal goals including poverty eradication.	Francesco Gonella	Ca' Foscari University of Venice	Italy
9655	0				Regional aspects and knowledge gaps need more emphasis in this introductory chapter to better frame the analysis in the report	We have reflected regional aspects crucially in section 1.6 including regional emissions and wellbeing.	Mustafa Babiker	Saudi Aramco	Saudi Arabia
14931	0				One of the most policy-relevant information emerging from this WGIII assessment is the analysis and classification of 1.5°C pathways. The classification of 1.5 pathways has changed compared to AR5 or SR1.5 and it has to be much more clearly explained and laid out which revisions have taken place. There has to be a clear line of reference to both assessment reports. Chapter 1 is the place to do that and it currently does not provide any specific information in this regard. The question of which historical warming estimate is used, for example, is absolutely fundamental to the classification, yet this information is hidden in a subsection of ANNEX C. Please elevate and cross-reference this information in Chapter 1 in a form that can be utilised by the SPM as well. A schematic comparing the different classifications and baselines should be included as well. This is the information policy makers are looking for as it is crucial to maintain a clear line of sight to previous IPCC assessments, in particular to AR5 which informed the Paris Agreement.	We believe that the chapter references 1.5 in ways that are consistent with the outline of the chapter. Other chapters such as Chapter 3, 4 also incorporate relevant references to 1.5 pathways .	Government of Saint Kitts and Nevis	Department of Environment	Saint Kitts and Nevis
22863	0				Please consider including a statement on how the report was largely written before the health crisis and is based mainly on research and literature dating from before the health crisis. Thus the consequences of the health crisis could not be fully taken into account on the trajectories of chapter 3, and in the different chapters.	The role of COVID-19 pandemic has been incorporated in the chapter.	Government of France	Ministère de la Transition écologique	France
24883	0				A relevant recent development compared to AR5 regards the understanding and reconciliation of the differences on land-use CO2 fluxes between global models and national GHG inventories (GHGI). While this looks very specific for the AFOLU sector (ch. 7), with clear implications for Ch. 3 and 4, and for the SPM, I think it relevant enough to be briefly considered also in this introductory chapter. The reasoning is the following: (1) since NGHGI provide the basic information for climate policy and for assessing compliance toward the Paris Agreement (PA), and since the AR6 is expected to provide a key input for assessing collective countries' progress under the Global Stocktake (GST), any major discrepancy between NGHGI and the global models used in AR6 is relevant and as such worth to be discussed. In particular, the IAMs' emission pathways and the associated remaining global carbon budgets have an enormous conceptual importance for climate policy. To be fully useful as a benchmark, however, these pathways/ budgets should be conceptually comparable with national GHG inventories / climate targets (2) The discrepancy is only for one sector (AFOLU CO2) but is big enough (5 GtCO2/y) to have a global relevance - this is not a criticism to global carbon budget models/IAMs or to GHGIs, but just a factual and policy-relevant observation. This discrepancy is due to different approaches to estimate the 'anthropogenic' CO2 sink. It is already acknowledged elsewhere in the AR6 (Ch 7 and in the Glossary), in other high-level IPCC reports (SPM of SR CCL and in the SPM of SR 1.5C), and is an issue of concern under UNFCCC (in light of the GST starting in 2022). (3) recent literature (see Ch. 7.2.2.5) indicate possible pragmatic ways forward to reconcile the discrepancy between global models/IAMs and GHGI. Given the above, the authors of this chapter may consider mentioning briefly the issue (possibly in section 1.3), e.g. "Compared to AR5, new evidence showed that the AFOLU CO2 estimates by the global models assessed in this report are not necessarily comparable with national GHG inventories, due to different approaches to estimate the 'anthropogenic' CO2 sink. Possible ways to reconcile these discrepancies are discussed in Chapter 7."	This 'Grasi' issue is too detailed to be explained in detail but your since sentence was helpful and has been included, with cross-referred to Chapter 7	Giacomo Grassi	Joint Research Centre, European Commission	Italy

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31111	0				Chapter 1 does a poor job in presenting the pressing case for a new climate treaty. Under the Paris Agreement, the energy transition is too slow to prevent catastrophic results from climate change.	That is not the task of IPCC - IPCC assesses the state of knowledge and cannot make policy prescriptive statements	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
47429	0				The WGIII AR6 pathway classification, in particular the classification of 1.5 pathways, has changed compared to SR1.5 and WGIII AR5. Since this is such a fundamental part of the assessment, the WGIII AR6 rationale has to be explained in more detail, including a clear comparison to previous assessments in terms of changes that have been introduced. This should include a clear figure/schematic comparing all three assessment reports. Currently, Chapter 1 lacks any specific information in this regard. Please make sure to streamline with ANNEX C in order to provide clear and digestible information, including changes in historical baselines etc., so that policy makers have this crucial information readily available in the context of the Paris Agreement.	More info included with some cross-references	Government of Saint Lucia	Department of Sustainable Development	Saint Lucia
50171	0				The new pathway logic compared to previous reports should be further elaborated. It is currently not clear how and why changes were made. Overall, there seems to be a too large number of pathways, which makes their comparison more difficult. Please consider reducing these to a smaller number, and clearly point out key assumptions for each. In particular, it should be highlighted whether these achieve not only climate but also development goals - as currently only the 1.5-SP seems to be in line with both. Please clarify.	This was not our area - overall IPs have been revised	Anna Main	Ministry of Foreign Affairs and	Samoa
50611	0				From my (non-specialist) point of view, the outline of chapter 1 is easy to follow up to section 1.5. However, I don't understand the point of sections 1.6 and 1.7. How are the four frameworks of section 1.6 chosen, why are they important for the rest of the report, how are they actually used by the other chapters? Section 1.7 is entitled "multi-level governance" but the text seems to refer to other concepts as well, and it does not include any reference to the other chapters. Some concepts introduced in sections 1.2 to 1.5 are repeated in sections 1.6 and 1.7, without explaining why it is necessary to discuss them again here for the framing of the WGIII report.	The structure of the chapter has been revised to enhance flow and reduce redundancies. The title of the section has been changed. We have sought to clarify - clearly economics and equity are important, but the Paris goals imply major transformations (hence transitions theory) and the reality of slow progress to date can only be understood with reference to psychology and politics - hence the four, which we have also tried to indicate in terms of their correspondence with the 'Dimensions of Assessment'	Anne Marie Treguier	CNRS	France
50619	0				In WGI, the improvement of cross-working group exchanges and coordination is emphasized in chapter 1 and other chapters. The link between WGI and WGIII for scenarios is discussed in WGIII chapter 3, and also in annex C. Shouldn't this close collaboration between WGs be also discussed in chapter 1 of WGIII, as an example of progress between AR5 and AR6?	We have entered a short indication of this	Anne Marie Treguier	CNRS	France
51859	0				The given frame focuses on Paris Agreement and uses it as a term of reference for the report in general. The IPs are framed in terms of Paris goals rather than the broader goals of UNFCCC or the goal of achieving net zero emissions. However, the UNFCCC and all IPCC work provide a framework for member countries that is beyond Paris Agreement. Thus, the term of reference of AR6 and for the assessment reports in general should be the convention not Paris Agreement.	This is only partially correct. The Paris Agreement has extremely wide participation, and also its aims are the political interpretation of the UNFCCC primary Objective. We do not see a need to change	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
51879	0				Chapter Highlights: GHG emissions not aligned with PA goals. Climate mitigation needed to achieve SDGs. Multi-level CC governance is necessary to implement assessment and transformation frameworks.	Noted	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
51885	0				COVID-19 complete impact is still to be assessed in relevant to the global transition, this creates a huge gap in the future trajectories utilized in the report and it should be clearly stated in the level of confidence in the relevant statements.	Updated in the cross-chapter box	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
61593	0				The chapter refers to "renewable energy" throughout in regards to climate mitigation, even though it would be much more accurate and scientifically correct to use "low carbon". Renewable energy includes unsustainable and problematic - even high climate impact - energy sources while it also excludes one of our most potential low-carbon energy source nuclear energy. See more on the problems of the term "Renewable energy" and why "low carbon" should be used instead from Harjanne and Korhonen, 2018, https://doi.org/10.1016/j.enpol.2018.12.029	We have included reference to the potential role of nuclear, but AR6 is particularly about what has changed since AR5; the situation of renewables has changed radically, there hasn't been such obvious progress in nuclear	Rauli Partanen	Think Atom	Finland
63199	0				SDGs are central to many parts of the report. Suggest introducing a box on the SDGs where these are explicitly discussed. Chapter 1 is a suitable place to introduce the SDGs (e.g. Section 1.4.2 on Climate Change, Equity and the Sustainable Development Goals).	We believe the SDGs are sufficiently known and space is limited -	Government of Canada	Environment and Climate Change	Canada
66763	0		0		Strengths of this chapter include the wide diversity of conceptual frameworks, including ethical ones, the attention to SD linkages, and space given to important concepts, including socio-technical transitions. The FD could work, however, on tying this all together in a tighter manner. I do feel sometimes that different sections have been written by different people without an overall knitting together as a result of which the chapter feels a bit like it repeats ideas and themes under different organisational constructs. For example the drivers and framework sections overlap. The multilevel governance framework, while an important concept, comes off as a bit awkwardly stuck on.	Many thanks. We hope the FGD is tighter and more consistent.	Navroz Dubash	Centre for Policy Research	India
70227	0				Chapter 1 general comment. This chapter often goes beyond what is really necessary to understand the report as a whole. In my view less is more when it comes to an introduction as it increases the chances of getting read. The most important parts are sections 1.2-1.4 since these set the scene and explain how important concepts are dealt with in the report. Sections 1.5 and 1.7, while well written, could be a lot shorter since it is essentially summarising other chapters (the report already has an SPM and a technical summary). A high-level framing of the inherent logic in the report upfront would help the reader navigate the sections better. This could then be followed by an introduction of the key concepts needed to understand the report and a brief sneak preview of each chapter.	Noted. We tried to clarify the chapter by distinguishing Introductory material from Frameworks	Philippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
75869	0				Sometimes you just write AR5 or AR6 without specifying any WG. Please use AR6 / AR5 when you eman the whole assessment and if you talk about material from a WG please say which WG.	Noted, will scan and address.	Jan Fuglestedt	CICERO	Norway
75871	0				I would expect that this chapter address Loss and Damage since this is an issue that is prominent on the international agenda.	Of course this is important, but Loss and Damage is a WGII issue not WGIII	Jan Fuglestedt	CICERO	Norway
75875	0				As a part of the framing I think this chapter needs to explain the concepts net zero CO2, carbon neutrality, net zero GHG and GHG neutrality. See glossary. There is also a box in WGI Ch1.	Done so inc in FAQ, with cross-ref	Jan Fuglestedt	CICERO	Norway
75877	0				It is important to keep in mind that IPCC reports have to be policy neutral and not policy prescriptive. Sometimes I find that the text is going a bit too far towards being prescriptive	We have done a search and sought to amend accordingly	Jan Fuglestedt	CICERO	Norway

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76287	0				One issue that could be addressed in WGIII Ch1 is the public perception of development of global mean temperatures in the case of mitigation efforts and reduced emission. Quantifications of the role internal variability in masking the effects of mitigation in the near term has been done in several recent studies (e.g., Marotzke, 2019; McKenna et al., 2021; Maher et al., 2020; Samsat et al., 2020) and the time until detection for impact of emission reductions is addressed. See WGI Ch4. How this is communicated to and understood by the public may be an issue worth addressing in this chapter.	Noted, but comment didn't give references and these may be beyond the scope of intro chapter	Jan Fuglestedt	CICERO	Norway
77167	0				In the whole chapter, which is introductory, "renewable(s)" is used to refer to low-carbon-emitting sources, biasing the actual extent of the latter category while implicitly introducing a conclusion, which should not be the purpose in this chapter. A more generic phrasing should be preferred, for fairness.	We have included reference to the potential role of nuclear, but AR6 is particularly about what has changed since AR5; the situation of renewables has changed radically, there hasn't been such obvious progress in nuclear	Giacomo Grasso	ENEA	Italy
77169	0				In the whole chapter, never appears any consideration on the challenge resulting from the investment of significant resources as required to transform the current GHG-intensive system (Section 1.5.9), that would result in potentially hindering affordability for the people (higher taxes to sustain the investment on public money, or higher prices if on private money) or in the worsening of other basic services (still depending on the same source of money) which are the pillars for well-being and the pathways for other SDGs. This is particularly true for Section 1.5.9.	We do think we have addressed this, in both SD and in the Econ frameworks	Giacomo Grasso	ENEA	Italy
81867	0				The new pathway logic compared to previous reports should be further elaborated. It is currently not clear how and why changes were made. Overall, there seems to be a too large number of pathways, which makes their comparison more difficult. Please consider reducing these to a smaller number, and clearly point out key assumptions for each. In particular, it should be highlighted whether these achieve not only climate but also development goals - as currently only the 1.5-SP seems to be in line with both. Please clarify.	The number of illustrative Pathways has been reduced, and we have strengthened our coverage of them	Francella Strickland	Ministry of Foreign Affairs and	Samoa
43485	0				It would be appropriate to provide special research methods to examine more exactly actions which has done by the states in climate change mitigation and adaptation. What is the methodology for climate change mitigation and adaptation? How we should examine a specified country's actions in this case? How can we compare mitigation implementations with each other?	We have sought to address this	sadegh zeyaeayan	Head of national center for	Iran
48603	0				Welcome the introduction of issue around equity and fairness, ethics and justice but note that these could be more coherently addressed across the chapter to ensure that these issues are also examined in more explicitly 'people-centred' terms	Noted, tried to address	Lorraine Elliott	The Australian National University	Australia
50391	0				It would be appropriate to provide special research methods to examine more exactly actions which has done by the states in climate change mitigation and adaptation. What is the methodology for climate change mitigation and adaptation? How we should examine a specified country's actions in this case? How can we compare mitigation implementations with each other?	We have sought to address this	Government of Iran	Islamic Republic of Iran Meteorology	Iran
54577	0				Published in February 2021, IWG (2021) ""Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990 Interagency Working Group on Social Cost of Greenhouse Gases, United States Government"" contains important information that should be considered by the authors. Of particular use, IWG (2021) includes a section describing the scientific and economic advances related to damage functions. That section of IWG (2021) is submitted here as comment to the WGIII authors, and may be of particular use for Sections 1.6.2 and 3.6.1. IWG (2021) Section 5 (Scientific and Economic Advances) Damage Functions highlights: - At the core of IAMs are ""damage functions"" that map global mean temperature changes and other physical impacts of climate change into economic (both market and nonmarket) damages. Relative to how much progress has been made in modeling and improving our understanding of climate system dynamics and the physical impacts resulting from temperature change, efforts involved in, and the public resources targeted at, understanding how these physical changes translate into economic impacts have been significantly smaller (Auffhammer, 2018). Even so, in the time since the versions of the IAMs used in this TSD were published, there has been an explosion of research on climate impacts and damages. - Several efforts are underway to draw on recent literature for improving damage functions and to generate new damage estimates. In particular, the Climate Impact Lab is undertaking an effort to quantify and monetize damages at a fine spatial scale, relying on rigorous empirical methods to develop plausibly causal estimates for several sectors, including health (Carleton et al., 2020), energy (Rode et al., 2021), labor productivity (Rode et al., 2020), agriculture, conflict, and sea level rise. Other research efforts have sought to update the damage function for one sector in an existing IAM based on an updated review of the empirical literature on climate impacts pertaining to that sector (e.g., Moore et al., 2017, for agriculture damages in the FUND model). Damage functions specific to impacts within the U.S. have also been developed and improved for a number of sectors, such as impacts on coastal property, mortality due to extreme temperatures, transportation infrastructure, electricity supply and demand, water quality, recreation, and allergies (Neumann et al., 2020) and impacts of climate change on air quality and human health (Fann et al., 2021). Biodiversity loss is also a major potential source of potential damage. - Related to the development of damage functions, damages from climate change are uncertain and hence pose additional risks. Reductions in GHG emissions reduce not only expected damages, but also reduce the	This important comment was overlooked until late due to a misclassification in our systems, apologies. However, picked up at v.late stage - it applies significantly to WGI, and the Chapter 3 box, but in terms of our chapter 1, basics are referenced in section 1.7.1	Government of United States of America	U.S. Department of State	United States of America
54579	0				The vast majority of this chapter demonstrates a lack of basic expository writing skills. Especially because it is the introduction to the report, this chapter needs to present a clear outline of the main thesis or theses and supporting evidence. This basic style needs to be applied to every paragraph in the chapter. Word choice in many cases is bizarre; grammar is often poor. A strong copyedit earlier in the development of the chapter could potentially have prevented many embedded problems. For example, the authors appear to be unable to articulate clearly one of their main points: that mitigation is much more likely to be achievable if it addresses the needs of sustainable development. Instead, the authors say that mitigation will not happen unless sustainable development, equity, etc., are addressed. Perhaps this difference is not clear to someone for whom English is a second language? The reality is that many governmental policies (for any reason) have been enacted without any consideration of equity or sustainable development needs. This could happen with climate mitigation policies as well. Luckily the SPM does a much better job of expository writing.	Thank you for your comment. This will be taken care of during copy editing	Government of United States of America	U.S. Department of State	United States of America

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60511	0				Carbon Capture and Utilisation (CCU) is now considered as a solution to mitigate climate change in the IPCC AR6 WGIII SOD, however its definition and several key messages need to be refined to reflect the literature. CCUS is barely used anymore, but CCU and CCS are still mixed sometimes, especially when discussing the barriers and needs of CCS, which does not do good to CCU as the barriers and needs are not the same. CCU technologies are available now and offer solutions to reduce net CO2 emissions with an estimated potential impact of gigatons equivalent CO2 emissions. Indeed, CCU technologies have the potential to utilize up to 8 Gt of CO2 per year by 2050 (GCI, 2016, Hepburn et al., 2019), this is equivalent to approximately 15% of current global CO2 emissions. Moreover, When CO2 is captured directly and stored permanently via mineralization into building materials, CCU can also create negative emissions (e.g. Di Maria et al., 2020, Ostovari et al., 2020). Unlike other options, CCU technologies provide drop-in solutions which can be implemented without requiring significant modification of existing production, distribution and use infrastructure (e.g. Ampelli et al., 2015, Hepburn et al., 2019). Another important asset of CCU technologies is the utilisation of CO2 as carbon feedstock to replace fossil resources (e.g. Sternberg et al., 2017, Daggash et al., 2018, Kästelhön, et al., 2019, Thonemann, 2019) and support the development of a circular economy, e.g. when CO2 is used together with industrial wastes to create materials (e.g. Di Maria et al., 2020, Ostavari et al., 2020). CCU technologies have the potential to provide solutions to hard-to-abate sectors, but also to generate revenues through producing marketable products (e.g. Hepburn et al., 2019, Zhu, 2019). Because of their lack of granularity, Integrated Assessment Models (IAM's) have yet failed in simulating the complexity of the different CCU options to realize net zero or negative CO2 emissions (e.g. Detz and Zwaan, 2019). Consequently, no exhaustive quantification exists today on the climate mitigation potential of this large panel of technologies. However, their key role should be considered as one building block in a portfolio of mitigation measures (e.g. Wilson et al., 2016, GCI, 2016, Grüber et al., 2018, IEAGHG, 2019b, Detz and Zwaan, 2019). Following the CCU concept, CO2 can be captured at point sources or directly from the atmosphere and subsequently converted into valuable products such as building materials, chemicals, synthetic fuels (e.g. Styring et al., 2011; von der Assen et al., 2013, SAPEA, 2018, Kästelhön et al., 2019). The duration of the CO2 storage into a product strongly varies from days to millennia according to the applications. However, in term of environmental assessment, CCU technologies should not be assessed only with respect to the amounts of	This comment, and particularly its length, was far more appropriate for Chapter 11, I hope it was repeated there as I am afraid we overlooked until too late to forward it. Ch.1 is a Framing chapter covering a vast array of issues.	Célia Sapart	Université Libre de Bruxelles	Belgium
65591	0				Consider infographics that combine and aggregate the findings of three Special reports combined and integrated which are more appealing than tables and text (examples: Figures SPM.4 and SMP.2-1.5C Report, Figures SPM.3 and SPM.4 - Land Report (including Ocean and Cryosphere aspects), and Figures SPM.2, SPM.3 a-c, SPM.4, SPM.5 or TS.5, TS.6, TS.7AB, and TS. 8 from SROCC integrating Land components).	Beyond our capacity in Chapter 1	Mônica M. C. Muelbert	UNIFESP	Brazil
69891	0				Like many others, this chapter would strongly benefit from building on the IEA 2020 World Energy Outlook's Chapter 4 "Achieving net zero emissions by 2050" (NZE2050), as Chapter 11 Industry does. IEA 2020 focuses entirely on the actions to be undertaken by 2030. Building on recent evolution of technologies, notably solar and wind power and batteries, IEA2020 underlines some differences between its own findings and the IPCC 1.5°C scenarios. Most of them assume a lower level of population and economic growth than the NZE2050. Nuclear plays a much larger role in many IPCC 1.5°C scenarios than in the NZE2050: half of IPCC 1.5°C scenarios imply an increase in nuclear generation of 60% between 2019-30, compared with a 36% increase in the NZE2050. By contrast, renewables provide 60% of global electricity supply in the NZE2050 a larger share than is the case in around 80% of the IPCC 1.5°C scenarios. Oil use in 2030 in the NZE2050 is less than around three-quarters of the IPCC 1.5°C scenarios, natural gas use is less than around half of the scenarios. The amount of CO2 captured in 2030 in the NZE2050 is less than the level captured in half of the IPCC 1.5°C scenarios, and the 35 Mt CO2 captured through BECCS in 2030 in the NZE2050 is less than the level captured in 60% of the scenarios.	Noted, late due to a misclassification error sorry	Cédric PHILIBERT	Institut Français des Relations	France
83755	0				Carbon Capture and Utilisation (CCU) is now considered as a solution to mitigate climate change in the IPCC AR6 WGIII SOD, however its definition and several key messages need to be refined to reflect the literature. CCUS is barely used anymore, but CCU and CCS are still mixed sometimes, especially when discussing the barriers and needs of CCS, which does not do good to CCU as the barriers and needs are not the same. CCU technologies are available now and offer solutions to reduce net CO2 emissions with an estimated potential impact of gigatons equivalent CO2 emissions. Indeed, CCU technologies have the potential to utilize up to 8 Gt of CO2 per year by 2050 (GCI, 2016, Hepburn et al., 2019), this is equivalent to approximately 15% of current global CO2 emissions. Moreover, When CO2 is captured directly and stored permanently via mineralization into building materials, CCU can also create negative emissions (e.g. Di Maria et al., 2020, Ostovari et al., 2020). Unlike other options, CCU technologies provide drop-in solutions which can be implemented without requiring significant modification of existing production, distribution and use infrastructure (e.g. Ampelli et al., 2015, Hepburn et al., 2019). Another important asset of CCU technologies is the utilisation of CO2 as carbon feedstock to replace fossil resources (e.g. Sternberg et al., 2017, Daggash et al., 2018, Kästelhön, et al., 2019, Thonemann, 2019) and support the development of a circular economy, e.g. when CO2 is used together with industrial wastes to create materials (e.g. Di Maria et al., 2020, Ostavari et al., 2020). CCU technologies have the potential to provide solutions to hard-to-abate sectors, but also to generate revenues through producing marketable products (e.g. Hepburn et al., 2019, Zhu, 2019). Because of their lack of granularity, Integrated Assessment Models (IAM's) have yet failed in simulating the complexity of the different CCU options to realize net zero or negative CO2 emissions (e.g. Detz and Zwaan, 2019). Consequently, no exhaustive quantification exists today on the climate mitigation potential of this large panel of technologies. However, their key role should be considered as one building block in a portfolio of mitigation measures (e.g. Wilson et al., 2016, GCI, 2016, Grüber et al., 2018, IEAGHG, 2019b, Detz and Zwaan, 2019). Following the CCU concept, CO2 can be captured at point sources or directly from the atmosphere and subsequently converted into valuable products such as building materials, chemicals, synthetic fuels (e.g. Styring et al., 2011; von der Assen et al., 2013, SAPEA, 2018, Kästelhön et al., 2019). The duration of the CO2 storage into a product strongly varies from days to millennia according to the applications. However, in term of environmental assessment, CCU technologies should not be assessed only with respect to the amounts of	This comment, and particularly its length, was far more appropriate for Chapter 11, I hope it was repeated there as I am afraid we overlooked until too late to forward it. Ch.1 is a Framing chapter covering a vast array of issues.	Christian Breyer	LUT University	Finland
11119	1	1	1	1	I take my hat off. From start to finish I loved reading this chapter. Frankly, both chapters 13 and 14 (my own chapter) need to do as good a job succinctly describing policy-making issues at the national and international levels as you do here.	Thanks!	Anthony Patt	ETH Zürich	Switzerland

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14377	1	1	99	62	This is an interesting chapter that contains much pertinent material. However, there is a lot of duplication within it. Concepts such as equity, sustainable development and others occur repeatedly, and the reasoning behind this is not obvious. The logic that guides the flow of the chapter is unclear to the reader. The quality of the sections is also highly variable. A thorough English language edit might help to some extent.	Thanks - we have tried to streamline	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
14379	1	1	99	62	The entire chapter requires a very thorough English language edit to eliminate typographical errors, awkward phrasing, incorrect English, duplication, missing words, inconsistent use of acronyms, and redundancies. Some sections suffer much more from these problems than others. I have not indicated all the many mistakes throughout the chapter, on the assumption that someone will be going through the text with the aim of correcting these and improving the language. Please note this is not just a question of elegance, but also of clarity and ensuring that substantive errors are not inadvertently introduced.	We have now done so	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
43251	1	1	1	46	How the impact of climate change in Latin America can be weighed against different economic realities. Is it only indicated on the basis of poverty level?	This seems too specific for Chapter 1	Government of Chile	Ministry of Environment	Chile
61241	1	1	99	12	Consider replacing or amending the term "renewable energy" by "low-carbon energy." "As noted in Harjarne and Korhonen 2019, "renewable" by no means equals "sustainable" or even "low carbon" energy. Furthermore, there are good reasons to believe that the confusion permitted by equating "renewable" with "sustainable" and "low carbon" has helped and will help those parties who have a vested interest in promoting technically renewable but actually problematic if not downright unsustainable energy sources and practices, most prominently large scale bioenergy use (op. Cit.). Reference: Harjarne, A. & Korhonen, J. M. (2019). Abandoning the concept of renewable energy. Energy Policy 127, DOI: 10.1016/j.enpol.2018.12.029	We have included reference to the potential role of nuclear, but AR6 is particularly about what has changed since AR5; the situation of renewables has changed radically, there hasn't been such obvious progress in nuclear	Janne M. Korhonen	Lappeenranta University of Technology	Finland
80345	1	1	4	30	The various paragraphs of the Executive Summary state the failure so far to act in line with the climate targets but do not acknowledge the reasons for such a failure. Among the main reasons are i) the underestimation by policy makers of the implications of inaction in terms of well-being of the citizens and ii) the underestimation by economic actors of the economic and financial losses via both physical and transition risk (as discussed in Chapter 15). Policy makers expect to read from this AR WGIII a review of what the risks are for citizens and businesses. This is currently not appearing clearly and seems missing among the main messages.	We have tried to, in limited context of an Exec Sum	Stefano Battiston	University of Zurich	Switzerland
85169	1	1	99	1	"Urbanisation" appears only twice in the entire chapter: once on p.25, when urbanisation is identified as something that is affected by climate change and another time on p. 34 when it's mentioned in the context of interdependencies with transportation. Nowhere in the chapter in the chapter is there reference to urbanisation as one of the biggest socio-economic transformations of the 21st century that will significantly affect climate change. This gap must be addressed in the final draft. AR6 will need to set up the Special Report on Cities and Climate Change in AR7 and the thin treatment of urbanization and cities.	We have made more specific reference to urbanisation	Karen Seto	Yale University	United States of America
86875	1	1	99	12	Thank you so much for considering these comments, and for taking on the difficult task of integrating and synthesizing the entirety of WGIII. One overarching critique is there seems to be little mention of urban climate change trends and mitigation strategies in this chapter, and the framing of its corresponding chapter - Chapter 8 – could be improved by better integrating its themes/findings throughout this chapter. I note some text (eg., on pg 34) that delves into urban activity and climate change, but urban areas are otherwise largely left out from the discussion integrating the WGIII chapters together despite many opportunities to include it. In subsequent comments, I provide specific substantive suggestions of Chapter 8 themes and findings that could be included in certain sections in Chapter 1 (that is, text where urban emissions and governance trends and/or mitigation could be better integrated). These changes would better frame/capture Chapter 8 and explain why urban mitigation is a key integrative approach to curbing climate change.	We have made more specific reference to urbanisation	Meredith Keller	Yale University	United States of America
80347	1	10	1	13	Passage "Continuing investments in carbon-intensive activities would heighten the multiple threats to human development and well-being associated with climate change, risk assets being stranded, and impede societal and industrial transformation towards low carbon development.". In order to be more informative it would help to state "why" there are continued investments in carbon-intensive activities, when alternatives exist. One reason is that the risks arising from such a strategy are not understood or that they are ignored. This could be stated clearly. Indeed, once the physical risks of inaction are recognised, then the risks of a delayed and disorderly transition can also be recognised and the incentives for an early transition become clear. At the moment, the risks associated with these options and the otherwise obvious superiority of the early transition is not recognised not only by the fossil industry but also by financial markets which perceive low and high carbon activities as having the same risk. As a result no reallocation of capital takes place and the targets are not met. The failure of recognising the risk is at the core of the problem and this should be reported.	This indeed is a primary reason for our section on Drivers and Constraints!	Stefano Battiston	University of Zurich	Switzerland
9657	1	15	1	17	Discussion of Covid-19 implications does not fit well within this paragraph. Perhaps better move it to some other paragraph	Reorganised, though nothing was ideal	Mustafa Babiker	Saudi Aramco	Saudi Arabia
8947	1	19	1	21	This statement is embedded in the sustainable development paradigm, without addressing the difference with the concept of sustainability. The assumption -actually questioned by various schools of thought- that the primary need is that of development (mostly intended as economic growth) pervades the entire document. Right or wrong this is to be, I would expect a more explicit statement that this was the choice of the narrative.	The chapter highlights the utility and limits of different frameworks and approaches for understanding and tackling the climate challenge. This includes the frameworks that emphasize market mechanisms and economic growth. The chapter makes the point that sustainable development paradigm is also contested concept. However the chapter makes the point that despite the contestation of the meaning sustainable development, the concept offers a generally accepted framework for the pursuit of environmental conservation and wellbeing around the world.	Francesco Gonella	Ca' Foscari University of Venice	Italy
3979	1		99		The text is very clear, complete and objective. It brings, in my understanding, fundamentally all the information pertinent to the treated subject. The section is very well written and the authors were very responsible and assertive in dealing with the subject in question. For these reasons I have nothing significant to add as I understand that the topic is being treated very clearly and completely. The authors are to be congratulated for the excellent work.	Thank you	FABIO RUBENS SOARES	USP - Universidade de São Paulo	Brazil

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
9823	1		3		The systematic of the review is comprehensive enough to picture what is inside the report. The document tries to address as comprehensive as it can that it tries to explain in several approaches. Starting from the previous finding as a baseline until the gaps and the roadmaps. This chapter summarizes all of the content in the report in a very concise and systematic way.	Thank you	Government of Indonesia	Ministry of Environment and	Indonesia
14381	2	7	2	7	What is meant by "...and the 2015 agreement"? Should this be the Paris Agreement?	This section also refers to a number of other agreements and processes in parallel such as Adis Ababa and the Talanoa dialogue.	Joanna Depledge	Centre for Environment, Energy	United Kingdom (of Great Britain and Northern Ireland)
48429	2	7	2	8	Chapter 1, Table of Contents: Capitalize the word 'Agreements' in the heading for 1.2.2	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48431	2	8	2	9	Chapter 1, Table of Contents: Insert the word 'the' before 'Assessment' in the heading for 1.3	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48433	2	9	2	10	Chapter 1, Table of Contents: Capitalize the words 'Impacts' and 'Risk (and and an s)' in the heading for 1.3.1. Please note that there is no 's' on risk in that heading	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48435	2	10	2	11	Chapter 1, Table of Contents: Capitalize the word 'Regional' in the heading for 1.3.2	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48437	2	12	2	13	Chapter 1, Table of Contents: Capitalize the Words 'Lessons, Risks and Opportunities'.	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
4303	2	13	2	13	Pt. 1.3.4 ... other ...?	The chapter has undergone significant restructuring and copy editing in order to address these issues	Alka Bharat	Maulana Azad National Institute	India
48439	2	15	2	16	Chapter 1, Table of Contents: Insert the word 'the' before 'assessment' and capitalize the word 'Assessment' in the heading for 1.3.6	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
12791	2	17	2	18	DON'T OVERLAP PAGE NUMBERS	The chapter has undergone significant restructuring and copy editing in order to address these issues	Amanullah Amanullah	Department of Agronomy, The	Pakistan
4305	2	20	2	20	Add national concerns and broad systems of Human settlements and social systems ... as it is action level	The chapter has undergone significant restructuring and copy editing in order to address these issues	Alka Bharat	Maulana Azad National Institute	India
48441	2	20	2	21	Chapter 1, Table of Contents: Remove the comma after 'Drivers'. It could possibly read as 'Drivers and Constraints of Climate Mitigation: System Transitions/Transformations in the heading for 1.5	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
4309	2	23	2	23	pt. 1.5.3 ... Add Technology and skills	The chapter has undergone significant restructuring and copy editing in order to address these issues	Alka Bharat	Maulana Azad National Institute	India
4307	2	24	2	29	pts 1.5.4, 1.5.5 and 1.5.9 ... have overlapping heads ... consider overlaps and gaps	The chapter has undergone significant restructuring and copy editing in order to address these issues	Alka Bharat	Maulana Azad National Institute	India
4313	2	30	2	30	before pt. 1.5.10 ... Add compounding effect	The chapter has undergone significant restructuring and copy editing in order to address these issues	Alka Bharat	Maulana Azad National Institute	India
4315	2	30	2	30	after 1.5.10 ... Add heads for global normalisation and country specific	The chapter has undergone significant restructuring and copy editing in order to address these issues	Alka Bharat	Maulana Azad National Institute	India
4311	2	31	2	31	pt. 1.6 ... Add level of 'good enough'	The chapter has undergone significant restructuring and copy editing in order to address these issues	Alka Bharat	Maulana Azad National Institute	India
48443	2	33	2	34	Chapter 1, Table of Contents: Capitalize the words 'Cost-Benefits', in the heading for 1.6.6	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48445	2	37	2	38	Chapter 1, Table of Contents: Capitalize the words 'Cost-Benefit', 'Cost-Effectiveness' and 'Dynamic Efficiency' in the heading for 1.6.4	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
12793	3	1	3	2	write uniform multi-level or Multi-level	The chapter has undergone significant restructuring and copy editing in order to address these issues	Amanullah Amanullah	Department of Agronomy, The	Pakistan
48447	3	2	3	2	Chapter 1, Table of Contents: Capitalize the words 'Multi-Level' in the heading for 1.7.1	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48449	3	4	3	5	Chapter 1, Table of Contents: Insert an 's' after the word 'Innovation' in the heading for 1.7.3	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
4317	3	5	3	5	Add 1.8 ... Resilience	The chapter has undergone significant restructuring and copy editing in order to address these issues	Alka Bharat	Maulana Azad National Institute	India
48451	3	6	3	7	Chapter 1, Table of Contents: Capitalize the words 'Gaps', in the heading for 1.9	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48453	3	8	3	9	Chapter 1, Table of Contents: Capitalize the words 'Asked' and 'Questions' in line 8	The chapter has undergone significant restructuring and copy editing in order to address these issues	Carol-Anne Blenman	Violeta Consulting Services	Barbados
6837	4	1	57	39	Although this Chapter presents persuasive arguments, some sections appear as if independent of subsequent Chapters of the report. The role of Chapter 1 as the framing Chapter for WGIII AR6 should be more obvious in the next iteration. Chapter 1 must link conceptual issues and framing to subsequent Chapters.	Thank you. We took this comment seriously and it led us to change the structure of the paper and draw out more of the framing elements in the chapter and link to other chapters. We hope you find the new structure and signposting work better,	Debra Roberts	EThekweni Municipality	South Africa
6839	4	1	57	39	Chapter 1 appears to be largely a literature review and lacks the rigour expected of an IPCC assessment. IPCC confidence statements are hardly used in the Chapter. The executive summary contains assessment statements of the quality of evidence but not an assessment of the authors' confidence in the statements. The underlying Chapter does not provide any assessment of the evidence that corresponds with what is presented in the executive summary. Furthermore, confidence statements in the entire Chapter come from reporting of findings of previous IPCC reports.	The structure has been revised. Confidence statements have been added; the lines of sight to statements made in the Exec Sum is clearer and confidence statement has been provided in relevant places. We have worked to improve the rigour of the assessment throughout the chapter.	Debra Roberts	EThekweni Municipality	South Africa
6841	4	1	57	39	The role of urban areas as important sites of climate change mitigation has not been given sufficient attention in this Chapter. This should be prioritised in the next iteration with a clear linkage to Chapter 8.	The role of urbanization has been given greater prominence and links to other chapters have been made.	Debra Roberts	EThekweni Municipality	South Africa
50501	4	1	4	1	Overall, the text of each ES statement seems a bit long, with many ideas expressed in each of them, and the reader gets lost. The first ES statement could probably be split in two, for example. Another question: is it OK that the ES of chapter 1 references other chapters, or should it rely on the sections of chapter 1 only?	The Executive Summary has been significantly revised. We believe the statements are now shaper and more crisp. We believe it is OK to reference other chapters in the ES where appropriate	Anne Marie Treguier	CNRS	France
65589	4	1	62	43	Standardized the citation of references. Examples: page 6 several lines (09, 21, 22, 23, 25, 29), page 7 lines 26 and 28, page 60, line 42 and many others.	Thank you. This has now been addressed.	Mônica M. C. Muelbert	UNIFESP	Brazil

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
69893	4	1			The Executive Summary fails to name areas of great improvement since AR5, namely solar PV, wind power and batteries, which are truly game-changers. Solar PV is not mentioned before p.19. The transformative potential of these are very large. I would suggest building here on Grubb, 2018, Conditional Optimism: Economic Perspectives on Deep Decarbonization, Institute for New Economic Thinking, Dec.5, Figure 1 (a). The economics of PV and wind, now the least expensive source of bulk electricity in many countries, and in some cheaper (as new built) than just running existing coal plants, suggest after a long development PV and wind power are on the brink of a rapid expansion following a logistic curve. Furthermore, electrification of end-use sectors (buildings, industry, transports), mostly directly, in some cases (chemical industry, steel making, deep sea shipping and aviation) through electrolytic production of hydrogen, will support a massive expansion of the electric systems. As most these new electric loads can be interrupted during demand peaks, this extended electrification will ease the integration of variable renewables in the electric grids. You may also quote China National Renewable Energy Center 2019 China Renewable Energy Outlook 6&8, that suggests that the share of electricity in final energy could reach 58% in buildings, 51% in industry and 39% in Transports by 2050 in China, while the share of electrolytic hydrogen would reach 2.3% in 2035 and 4.5% in 2050.	The ES and key areas of improvement since AR5 are highlighted in the ES including the improvements in clean technology, role of policy, fall in the cost of renewable technology. Thank you.	Cédric PHILIBERT	Institut Français des Relations Internationales	France
77095	4	1	5	38	Comments #4, #5 and #6 apply.	The ES has been revised substantially. We believe the message is much clearer.	Jim O'Brien	Expert Reviewer AR6 SOD Working Group	Ireland
15189	4	3	4	5	It is suggested to change the sentence "Current Greenhouse Gas (GHG) emission trends at the global level, extrapolated, are incompatible with the goals agreed in the Paris Agreement" into "Greenhouse gas emission (GHG) trends at the global level fall far short of the goals agreed in the Paris Agreement".	The goal of Paris Agreement is futuristic with the end of the century as the key date. Therefore it seems to us that it would not be very accurate to say that current trends fall short of the goal agreed. We think it is more accurate to consider whether current trends, if extrapolated to the end of the date can lead to the achievement of the Paris Goal.	Government of China	China Meteorological Administration	China
48455	4	3	4	5	Chapter 1, Executive Summary: Rearrange words as follows - 'When extrapolated, current Greenhouse Gas (GHG) emission trends at the global level are incompatible with the goals agreed under the Paris Agreement which highlight the need for urgent and accelerated mitigation actions at all scales'.	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
51887	4	3	4	5	Phrases like "the need for urgent and accelerated mitigation actions at all scales" policy perspective and should be eliminated from the report.	Thank you. We have revised the ES and report to remove policy prescriptive statements.	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
75879	4	3	4	5	I find this sentence unclear. What is meant by "extrapolated"? And it also seems to be inconsistent with what is written on lines 13-14 below.	The goal of Paris Agreement is futuristic with the end of the century as the key date. Therefore it seems to us that it would not be very accurate to say that current trends fall short of the goal agreed. We think it is more accurate to consider whether current trends, if extrapolated to the end of the date can lead to the achievement of the Paris Goal.	Jan Fuglested	CICERO	Norway
86887	4	3	4	18	See Chapter 8, Figures 8.10 and 8.14 and corresponding subsections.	These sections and figures in the report have been noted. Thank you.	Meredith Keller	Yale University	United States of America
27505	4	4	4	5	Delete "which highlights the need for urgent and accelerated mitigation actions at all scales" as this is not agreed language as per the Paris Agreement.	The sentence has been revised.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
79879	4	4	3	18	Include reference to the summary of results of the UNFCCC preliminary synthesis report, Feb. 2021 and connect it to Chapter 1 lines 5-10.	Updated by NDC update	Carlos Ruiz Garvia	UNFCCC	Panama
79881	4	4	3	18	Make reference to the COVID 19 situation and impact on mitigation action in the introductory section as this is relevant.	Thank you. This has now been addressed.	Carlos Ruiz Garvia	UNFCCC	Panama
48457	4	5	4	5	Chapter 1, Executive Summary: Insert the word 'the' before IPCC's in line 5	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
77991	4	5	4	5	(Page 1 of 2) Suggested edit: The term "mitigation" in a climate change context is widely interpreted as referring to GHG emissions reduction. I recommend substituting the terms "triage, mitigation, adaptation and restoration" for the term "mitigation" here, and adding a statement that: "In this report, unless specifically noted otherwise, the term 'mitigation' when referring to the climate refers broadly to 'triage, mitigation, adaptation and restoration'." Rationale: For including "triage": The IPCC 2019 SROCC documents the rapid melting of Arctic summer sea ice. Current data suggests that, in the absence of proactive "triage" efforts to prevent this, the first "blue ocean event", or, the beginning of a complete melting of the Arctic summer sea ice – the first climate "tipping point" (Lenton et al, 2009), could occur as soon as 2025 (PIOMAS, 2021). Multiple studies suggest that crossing this first tipping point will cause abrupt acceleration of global warming and "Arctic amplification" with increased adverse global climate impact and risk of crossing additional climate tipping points, and that climate triage methods may be able to temporarily prevent crossing this tipping point until sufficient GHGs have been drawdown to permanently prevent it from occurring, see references in (Baiman, 2021,2020). Climate triage efforts are urgently necessary now per the PA Article 8 international recognition of the "... importance of averting, minimizing, and addressing loss and damage from the adverse effects of climate change...". For including "adaptation": Article 8 of the Paris Agreement (PA) states that: "Parties recognize the importance of averting, minimizing and addressing loss and damage associated the adverse effects of climate change, including weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage." ratifying 2013 COP19 Warsaw International Mechanism (WIM) commitments (Mace and Verheyen 2016). For including "restoration": IPCC AR5 notes that Carbon Direct Removal (CDR), or climate "restoration", is necessary to avoid crossing 1.5 and 2.0 climate guardrails. This is also extensively discussed in Chapter 12 of this draft IPCC AR6 WGIII. The need for GHG "removals" is also included in the Articles 4.1, 4.12 and 4.13 of the PA. Following the PA Article 8 statement above, new technologies like Global Thermostat's "carbon-negative" fossil fuel (or renewable energy) powered electric power generation plants suggest that increased energy use compatible with rapid economic development could play a key role in reducing atmospheric and oceanic carbon and restoring a stable climate. References: Baiman, Ron. 2021. The Climate Crisis and a Renewable Energy and Materials Economy (REME): A Global Green New Deal (GGND) that Includes Arctic Sea-Ice Climate Triage and Carbon Cycle Climate Restoration. Presentation to I16 Economic Association/Allied Social Sciences (AEA/ASSA) annual meeting. Edited version submitted for publication	Comment rejected. We have been guided by the definition of mitigation in the glossary which we think sufficiently captures the meaning intended the report. We think it will confuse readers and be inconsistent with long practice to adopt a definition of mitigation that includes adaptation and restoration. The point has been made in many other sections of the report that wholistic response to climate change requires effort at mitigation and adaptation some of which might include restoration. The role of synergies and trade offs with other societal goals have also been stressed in the report.	Ron Baiman	Benedictine University	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
78043	4	5	4	5	(Page 2 of 2) Baiman, Ron. 2020. Financial Bailout Spending Would Have Almost Paid for Thirty Years of Global Green New Deal Climate: Triage, Regeneration, and Mitigation. Review of Radical Political Economics 52(4): 650-661 https://doi.org/10.1177/0486613420945406 Lenton et al. 2008. Tipping elements in the earth's climate system. PNAS 102(6) Feb. 12. Mace, M.J., and Roda Verheyen. 2016. Loss, Damage and Responsibility after COP21: All Options Open for the Paris Agreement. Review of International Community & European Environmental Law 25(20). PIOMAS. 2021. Plot of Polar Science Center Ice Volume Data 1979 – present. Accessed at: https://14adebb0-b62cb3a1a-sites.googlegroups.com/site/arcticstepinguin/home/piomas/grf/piomas-trnd1.png?attachauth=ANoY7Zr4y3SE5uUNGTbaCg72ZpE8evGSew-XIS4TlgTMTH6s-4jQeLPkIATIRJIHeUJVOXCKXU17Rka9WSGBRXCIMROZ0yPEB_Vs1X3r0MYb8igUkcnvzT7-MCm26yXj805F_QiIVGgPD628Gm0bNo1Er9D0D0ph4g84hxQ9mhs5clqbfJNBz71K8xMhrPrE1AmNnVVL99xYPaLNZPzyNXZG4TW9gRWJG1QMM1LDihNeUAuzPnV3rYjGMawbY0YfWJ&attdirects=0	We are not very sure we fully understand this comment. However, we have stressed the significance of the COVID-19 pandemic in the ES and the chapter (using a cross chapter box on COVID-19). The role of political economy as a driver and constraint against climate action has also been highlighted in ES and several places in the chapter.	Ron Baiman	Benedictine University	the
48459	4	6	4	6	Chapter 1, Executive Summary: Insert the phrase 'emerged including a greater...' after 'important changes' in line 6.	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
29715	4	7	4	10	Please consider if moving "remains large" further upfront in this sentence makes it easier for the readers to explicitly understand and grasp the large magnitude of this gap. In our view a formulation like "However, while ... GHG emissions, the gap remains large between current ... Paris goals." would make this information more obvious for the readers.	Thank you	Government of Norway	Norwegian Environment Agency	Norway
48461	4	7	4	8	Chapter 1, Executive Summary: Replace 'However, while' with 'Even though' in line 7-8	Thank you. The text has been revised.	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48463	4	8	4	9	Chapter 1, Executive Summary: Insert 'developmental' before 'gap'; 'the' after 'between'; 'the extent of' before 'current implementation'; Insert phrase 'A continuation of' before 'investments' in line 9	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
85697	4	8	4	9	Suggest adding a sentence to describe NDCs. The executive summary should be read as a standalone text.	We think the meaning is clear. NDC is defined in the glossary.	Government of Australia	Department of Industry, Science and Energy	Australia
6843	4	10	4	13	The authors should consider including impact on the ecosystems and ecosystem services to broaden the impact of investments in carbon-intensive activities.	The impact of climate change on ecosystems and the role that ecosystem services can play in climate mitigation and adaptation have been highlighted in the chapter.	Debra Roberts	EThekweni Municipality	South Africa
48465	4	10	4	10	Chapter 1, Executive Summary: Replace 'meeting Paris goals...' with 'the goals outlined in the Paris Accord...' remains large in line 10.	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
51861	4	10	4	10	The use of the term 'carbon-intensive activities' should be further specified as it implies a wide range of activities. The term requires definition in respect of the context.	We have noted following literature that continuing investments in carbon-intensive activities at scale will heighten the multitude of risks associated with climate change and impede societal and industrial transformation towards low carbon development. There is multitude of such investments that listing them all here would not be helpful. The rest of the chapter gives several examples of such activities.	Government of Saudi Arabia	Sustainability Advisor to the Government	Saudi Arabia
48467	4	11	4	12	Chapter 1, Executive Summary: Replace 'would' with 'will'; Reword 'heighten multiple threats...' as 'heighten the multitude of climatic threats posed to human development and well-being'; Insert 'result in' before 'risk assets...'; Insert an 's' on 'transformations' before towards in line 12. This will maintain the tense of the sentence.	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
61163	4	12	4	12	Disagree with the risks of stranded assets being mentioned alongside climate impacts and threats to human development. First, they are two different types of risk. The risk of stranded assets comes from policy decisions to address climate change, including it in this list conflates the climate crisis with implications of policies that address it. Secondly, pinning "stranded assets" with "threats to human development and well-being" implies that both of these risks are of equal value and should be considered with the same regard. "...risk assets being stranded..." is at a different scale and should not be included in the list. I recommend "risk assets being stranded" be included in a separate sentence on policy risks or not at all.	The sentence has been revised, thank you.	Andrea Cristina Ruiz	Abdul Latif Jameel Poverty Action Fund	United States of America
15191	4	13	4	14	In the sentence "Meeting Paris Agreement goals requires global CO2 emissions to peak before 2025, and decline to net zero generally within the third quarter of the century", it is suggested to explicitly indicate the confidence level of the findings here.	This sentence has been edited out.	Government of China	China Meteorological Administration	China
15375	4	13	4	13	Are these numbers in relation to the commitment to limit warming to well below 2 degrees or the goal of limiting warming to 1.5? Would clarify which Paris goal/commitment is being referred to here as they are specific numbers tied to a vague term, which decreases their meaning.	This sentence has been edited; thank you.	Christie McLeod	Miller Thomson LLP	Canada
17769	4	13	4	14	(1 ES) must peak by 2025 is a strong statement. It's unlikely to happen so we need to be able to say what that means, i.e. we don't all give up and party	This sentence has been revised; thank you.	Jonathan Lynn	IPCC	Switzerland
17941	4	13	4	14	This sentence is misleading: the Paris Agreement goals would almost certainly not be reached with a peak in 2025 and net-zero CO2 by 2075 as implied. Care needs to be taken in the interpretation of the results presented in the report	This sentence has been completely revised; thank you.	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
22667	4	13	4	13	Referring to Paris Agreement goals is ambiguous - it would be better to separate and be clear on the consequences for timing for keeping well below 2°C (the timescales given?) and 1.5°C (sooner)	The statement has been revised; current trends when extrapolated do not meet either of the goals - the well below 2°C and the 1.5°C degree. So there is little to be gained by separating references to the two goals in the statement.	Government of France	Ministère de la Transition écologique	France
45677	4	13	4	14	The AR4 indicated the need for emissions peaking by 2015 for climate stabilization at around 2°C, the AR5 did not indicate a peak year since peaking was determined by the level of negative emission, while the AR6 gives 2025. Please explain why the AR6 again indicates a peak year and why it is 2025.	This statement has been revised to remove reference to peaking by 2025.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
48469	4	13	4	13	Chapter 1, Executive Summary: Replace 'Meeting Paris Agreement goals' with 'Attaining the goals outlined in the Paris Agreement' in line 13.	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
81135	4	13	4	14	It's unclear and confusing in my view to refer only to CO2 here, rather than all GHGs (even if they play different roles in achieving mitigation outcomes). I.e. please refer to 'net-zero CO2 AND deep reduction in non-CO2 emissions'.	We have revised the statement to indicate the need to the reduction of non CO2 emissions as well; thank you.	Andy Reisinger	Ministry for the Environment	New Zealand
83003	4	13	4	14	If the structure stays as it is, then you should change/specify "goals" into "staying below 1.5°C", or the full LTTG	Below 1.5 is not LTTG	Geden Oliver	German Institute for International and Development Studies	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
85287	4	13	4	14	This statement on global CO2 emission reductions implied by limiting warming to 1.5°C or likely below 2°C does not seem justified as a key statement of the report. In light of the illustrative pathways (Table SPM1) this seems to be more in line with C3 pathways than those limiting warming to 1.5°C with no or little overshoot (C1). Hence, it's not clear a) why this would limit warming to 1.5°C (except with high overshoot) b) why the IPCC would communicate 1.5°C benchmarks that are very different from those established in the SR15 c) why the IPCC would, in AR6, imply a peaking needed by 2025, when the AR4 already suggested that peaking was needed by 2015 (in 450 ppm scenarios). I suggest to derive this headline message from the C1 category of pathways. That category of pathways seems closest to meeting the Paris Agreement Article 2 definitions of 'holding' warming to 'well below 2°C' and pursuing efforts to limit warming to 1.5°C. Even the C2 category pathways give just a 50 % chance for peak warming 2°C. (Furthermore, regarding peaking by 2025, it is also inconsistent with the statement in TS, page 4, lines 23-25.)	Clarified but without detail - its an Intro chapter	Kaisa Kosonen	Greenpeace	Finland
48471	4	14	4	14	Chapter 1, Executive Summary: Insert 'to' before 'decline'; 'the need for' after 'implies' in line 14.	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
86411	4	14	4	14	This sentence should probably also mention (even in approximate terms) the important target of reducing by about half today's emissions by 2030, in order to avoid temperature overshooting along the trajectory towards net zero at 2050. The UNEP's Emissions Gap Report 2020 reports a necessary 34/57 GtCo2 (= 57%) reduction by 2030 from 2019 levels consistent with a trajectory to stay within 1.5° of temperature increase starting from Current Scenario (Table ES.1, Page 19 of the Emissions Gap Report 2020). In addition, because it would be very difficult to meet the target of halving emissions from 2019 levels if emissions will peak only in 2025, the sentence should probably not refer to such a date for peaking emissions. It should probably say something along the lines of "need to peak as soon as possible in the coming decade, in order to meet the 2030 target of halving emissions by 2030 to avoid overshooting past Paris temperature targets (especially 1.5°), per UNEP Emissions Gap Report 2020 (which is based on previous IPCC reports and current emissions' accounting)". This is also in line with the description of 1.5° and 2° pathways given in this Report's Summary for Policymakers (SPM).	2030 is not a formal global target, but a result of model studies which are the focus of Chapter 3 - and we note the key results in terms of the NDCs. The key policy-relevant foci re 2030 carried in the SPM	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
6845	4	15	4	18	Since the WGI report will be approved before WGIII, the authors should consider including the WGI COVID-19 box as an additional line of sight.	We do but not in Exec Sum	Debra Roberts	Ethekwini Municipality	South Africa
82529	4	15	4	15	This conclusive statement on line 15 is pivotal for the entire report framing, but the current wording is vague. "Ambitious action combining national initiatives with regional and global cooperation." Suggest replacing "initiatives" with "commitments and investments" and "cooperation" with "enabling policies and investments."	We believe "ambitious action" adequately captures the points and leaves governments to interpret as appropriate	Constable Kerry	Oxford University School of Geography	United States of America
12795	4	17		18	mitigation. remove this dot (1.2, 1.2.2, 1.3, 1.7, Chapter 3). And put dot at the end	Thank you	Amanullah Amanullah	Department of Agronomy, The University of Agriculture	Pakistan
48473	4	17	4	17	Chapter 1, Executive Summary: Insert 'the' after 'impacts'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
77993	4	18	4	18	Suggested Edit: "SPM A, 1.3.1, Chap. 3" to end of brackets. Below, I suggest adding statements in SPM A and 1.3.1 about the urgent need for a concerted international "climate triage" effort to try to slow or stop the Arctic summer sea ice from completely melting. Chap. 3 includes extensive discussions of the need for CDR or "climate restoration".	The comment is policy prescriptive - not the task of the IPCC which is to assess the state of knowledge	Ron Baiman	Benedictine University	United States of America
6847	4	19	4	30	This bullet needs to include assessment language.	Assessment language has been included; thank you.	Debra Roberts	Ethekwini Municipality	South Africa
17947	4	19	4	21	"recognising there are synergies and/or trade-offs" - It would be good if the authors could determine whether, overall, the benefits outweigh the costs and to include the net effect in this executive summary rather than leaving it open ended like it is currently.	Thank you, the sentence has been revised to reflect that overall there is a net benefit.	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
45717	4	19	4	21	Please add "Failures to address the sustainable development agenda, especially goals concerning equity and justice also have an effect on national mitigation efforts" or a similar addition "after "Globally [...] synergies and/or trade-offs." Rationale: The whole paragraph (line 19-30) describes not only the importance of mitigation in order to achieve the SDGs, but also vice versa: Failures to address the SDGs may also have a negative impact to achieve climate goals (see also p. 9., line 22-23).	We have revised the statement to reflect this thought. We have made the point that given the differences in historical and current responsibilities, degree of vulnerabilities and impacts, as well as capacities within and between nations, equity and justice are important considerations for effective climate policy and for securing national and international support for deep decarbonisation. We have also noted that achieving sustainable global development and eradicating poverty as enshrined in the 17 SDGs would involve effective and equitable climate policies at all levels from local to global scale.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
48475	4	19	4	19	Chapter 1, Executive Summary: Remove the word 'Globally'; Replace it with 'On the global scale,...'; Reword 'effective climate mitigation' as 'effective climate mitigation strategies'; Replace 'global sustainable development' with sustainability'...; Replace 'recognizing there are' with 'cognisant of their associated...'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
86885	4	19	4	30	Chapter 8 also goes into depth on SDGs, cobenefits, and climate change costs and mitigation.	Yes, you are right, we have now added chapter 8; thank you.	Meredith Keller	Yale University	United States of America
72413	4	20	4	20	As it is an introduction, I suggest to remind the reader the meaning of the acronym SDG here as it is its first use in the Chapter	Thank you	Sylvain Pichat	University of Lyon, Ecole normale supérieure de Lyon	Germany
17949	4	22	4	24	There is also evidence in the literature that carbon emissions decrease with economic progress - as economies transition from a manufacturing base to a service based economy. Could this also be discussed in this summary?	We think the link between economic progress and carbon emission historically is much stronger. The decoupling of carbon emission with economic progress mostly happens to a significant level if a conscious policy to that effect is pursued. In other places in the ES we have noted that many developed countries have managed to hold emission levels down. We have also mentioned that recent evidence shows countries can grow their economies while reducing emissions.	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
82531	4	22	4	22	"UN Sustainable Development Goals" should read "Sustainable Development Goals." The UN is going to great lengths to ensure that the SDG's and 2030 Agenda are not perceived to be a "UN" branded effort or endeavor, but rather are goals that the UN facilitated and that the world must implement. The Paris Agreement is similar -- it is not the UN Paris Agreement. In this context, I recommend all SDG and 2030 Agenda references in AR6 remove the UN mention.	Thank you	Constable Kerry	Oxford University School of Geography	United States of America
45679	4	23	4	24	Please mention that economic growth / development and GHG emissions have been decoupled in a number of countries, hence the relationship mentioned is not a permanent one.	This has been reflected in the ES and the chapter. We have mentioned in the ES that over twenty countries have also sustained emission reductions, and many more have accelerated energy efficiency and/or land-use improvements. We have also mentioned that recent evidence shows countries can grow their economies while reducing emissions.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
64437	4	23	4	24	Which kind of relationship are there between development and GHG emissions? Positive or negative?	The nature of the relationship is indicated in the statement as we have said that historically both per capita and absolute emissions have risen with industrialisation. But note that we have also noted that recent evidence shows countries can grow their economies while reducing emissions.	Adriana Silva	Venezuelan Institute for Science and Technology	Venezuela
45719	4	24	4	25	Please write "While the 2030 Agenda with its 17 SDGs is indivisible and all countries pledged action to achieve all SDGs, they have different priorities in achieving individual SDGs as dictated by their respective national conditions and capabilities." instead of "Countries have different priorities in achieving the SDGs as dictated by their respective national conditions and capabilities." Rationale: The 2030 Agenda and its SDGs are indivisible and all Countries have pledged to contribute to the implementation of each goal. Due to national circumstances they may prioritize or focus on different measures (e.g., . . . improving the food production chain or change consumption patterns in order to reduce food waste), but they may not cherry-pick the implementation of one goal over another (see for example: UN, General Assembly, A/RES/70/1, Paragraph 18, p. 6/35 https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E).	This suggestion has been adapted; thank you.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
51863	4	24			The discussion on SDGs considers the different priorities for countries in achieving the SDGs as dictated by their respective national conditions and capabilities. This is a key aspect in evaluating the options. However, the call for accelerated transformation does not align with the national circumstance. Rather, planned transitions towards sustainable economies/systems is the way forward. It is specifically stated in the discussion that "Moreover, countries differ enormously in their respective situation regarding their development path a condition which affects their capability, goals, priorities and approach to the pursuit of sustainability"	The call is for acceleration of transformation at all levels while allowing that the pace and nature of action will vary across countries reflecting differences in national circumstances. Therefore the two sides of the issue are well highlighted in a balanced way.	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
14383	4	25	4	25	"dictated" is not a good term. I would suggest "influenced" or "informed".	Thank you	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
65247	4	26	4	28	Thank you for clarity and word choice of equity and justice in this framing. It is critical for effectiveness as well as for trust.	Thank you	Lindsey Cook	Quaker United Nations Office	Germany
14385	4	27	4	27	"important issues to address to get...". This sounds awkward. How about "equity and justice are important considerations for securing national and international support..."	Thank you	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
2971	4	28	4	29	The sentence beginning "Failures to address..." raises a different issue from those raised in preceding sentences. Delete from this paragraph or move sentence to line 21.	The sentence follows a sentence that says achieving sustainable global development and eradicating poverty as enshrined in the 17 SDGs would involve effective and equitable climate policies at all levels from local to global scale. Therefore the point about failure to address equity concerns is well placed.	Beth Edmondson	Federation University	Australia
48477	4	28	4	28	Chapter 1, Executive Summary: Replace 'Failures' with 'Failure' in line 28.	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48479	4	28	4	30	Chapter 1, Executive Summary: Sentences appear to be somewhat disjointed.	We have revised the ES and worked on making our sentences sharper and clearer. We believe that our editing has enhanced the flow of the overall flow of the argument.	Carol-Anne Blenman	Violeta Consulting Services	Barbados
12797	4	30	4	30	development.remove this dot {1.4, Chapters 2, 3, 4, 5, 13 and 17}. Same with line 46	Thank you	Amanullah Amanullah	Department of Agronomy, The University of Agriculture	Pakistan
4319	4	31	4	31	Add skills	We don't think that adding skills is necessary to enhance the meaning of the sentence. However the sentence has been edited out.	Alka Bharat	Maulana Azad National Institute of Technology	India
17951	4	31	4	31	"Including transformative changes" - this is very vague, could the authors be more explicit and mention the industries/sectors (energy) where change occurring at highest rate/ has biggest impact?	The statement has been edited out.	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
17953	4	31	4	46	Could the authors consider including a discussion on the potential for the sharing of relevant technologies which may assist low income - high carbon emitting economies to make leaps and bounds in their transition to low carbon economies? Which wouldn't have otherwise occurred if countries are left to their own devices/ faced with the market incentives to invest in green technologies	Thank you, this has been reflected in the ES; thank you.	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
17955	4	31	4	46	The steer of the point could be around how do we ensure that these technologies are developed at the fastest rate as possible and disseminated as far and widely as possible to have the greatest impact.	We have included the need for deployment at wide scale including the possible role of technology sharing; thank you.	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
22671	4	31	4	46	This paragraph seems to give a large emphasis to technological changes - it might usefully be rebalanced to give a clearer message on the need also for behavioural and consumption changes - cf page 7 line 11	Thank you. The message has been revised to give highlight to the different categories of the drivers for and constraints against climate action.	Government of France	Ministère de la Transition écologique et solidaire	France
27413	4	31	4	46	The take on technology advancement here is too one-sidedly positive, and should for balance also mention the worries of some experts about the role that visions of new technologies have in undermining policy progress. These papers give examples of this: 1) The co-evolution of technological promises, modelling, policies and climate change targets, McLaren, D., Markusson, N. 1/05/2020 In: Nature Climate Change. 10, p. 392-397., 2) The political economy of technical fixes: the (mis)alignment of clean fossil and political regimes, Markusson, N.O., Gjefsen, M.D., Stephens, J., Tyfield, D.P. 01/2017 In: Energy Research and Social Science. 23, p. 1-10. This comment obviously also has relevance in underlying parts of the report, e.g. 6.3.3.	We cover co-evolution significantly in section 7 but the biggest gains to date have been from technology	Nils Markusson	Lancaster University	United Kingdom (of Great Britain and Northern Ireland)
50503	4	31	4	46	This statement contains caveats ("However..." "both push and pull forces ..."). Should they be reflected somehow in the first sentence?	The sentence has been edited and restituted; thank you	Anne Marie Treguier	CNRS	France
61165	4	31	4	46	"Policies are mentioned in line 31-33 but not included in the paragraph after that. Line 35 alludes to policies as "technologies and systems at scale". It is important to include the word "policies" in this section to avoid the misunderstanding that technology alone can address complex climate issues. Policy innovation is imperative. For example- an electric vehicle is a low-carbon technology, but government policies such as carbon markets, company regulation, can change incentives and lead for adoption of these policies.	Thank you. The message has been revised to give highlight to the different categories of the drivers for and constraints against climate action.	Andrea Cristina Ruiz	Abdul Latif Jameel Poverty Action Fund	United States of America
29519	4	33	4	33	Especially the last part of this sentence is somewhat unclear, and need some revision in our view. In addition, please consider replacing "alternative development pathways, which could deliver multiple social and developmental goals" with "lower emissions pathways, which could have co-benefits to other SDGs." SDGs is a term well established with policy makers, and in our view covers both social and developmental goals.	This statement has been revised and edited.	Government of Norway	Norwegian Environment Agency	Norway
48481	4	35	4	35	Chapter 1, Executive Summary: Replace 'at scale' with 'at different scales'; Insert 'the development of' after 'in recent years', in line 35	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
60439	4	35	4	36	The term "clean energy technologies" is not accurate as no energy technology can be considered as clean when looking at the full production chain. It might be more adequate to write "low carbon footprint energy technologies or cleaner energy technologies in comparison to fossil fuel."	I have changed the phrase to "low carbon"	Célia Sapart	Université Libre de Bruxelles	Belgium
76299	4	35	4	36	The term "clean energy technologies" may be replaced with "low carbon footprint energy technologies or cleaner energy technologies in comparison to fossil fuel" since no energy technology is entirely clean.	Thank you	Deepak PANT	Flemish Institute for Technol	Belgium
78795	4	35	4	36	The expression "clean energy technologies" has to be precised. What is clean? GHG emissions? Resource extractors? The renewable energy it converts? To my knowledge, there is no energy technology that can be considered clean when looking at the full production chain from the mine to the waste or recycling. Considering that 100% recycling is hard to reach. Suggestions : "Low carbon footprint energies technologies compared to fossile-based energies on the GHG criteria..."	Thank you. We have adopted the term low-carbon technologies.	Sylvain Nizou	CEA	France
48483	4	36	4	36	Chapter 1, Executive Summary: Reword 'and declined in costs ...' as 'resulting in cost declines and sustained emission reductions within a significant number of countries'.	reworded this to "In recent years, the development of several low carbon energy technologies have expanded rapidly. These technologies have seen their costs decline allowing significant numbers of countries to achieve sustained emission reductions." Thank you for highlighting this sentence	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48485	4	38	4	38	Chapter 1, Executive Summary: Reword 'increased. This' as 'increased, which' in line 38	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
27507	4	39	4	40	In this Chapter, and throughout the entire report, it is preferable to refer to "the transition to low emissions development" rather than to "the transition to low carbon development".	We have used both low-carbon and low-emission development in the report. The concept of low carbon development is well understood in the literature as being consistent with development paths that imply low emission of GHG emissions.	Eleni Kaditi	Organization of the Petroleum	Austria
60441	4	39	4	40	"the transition to low carbon development" is not accurate. Suggestions: transition to a carbon neutral development or the transition to a carbon circular economy.	Thank you	Célia Sapart	Université Libre de Bruxelles	Belgium
76301	4	39	4	40	"the transition to low carbon development" may be repalced with " transition to a carbon neutral development or the transition to a carbon circular economy".	We have changed this to "a low carbon economy"	Deepak PANT	Flemish Institute for Technol	Belgium
78797	4	39	4	40	The expression "the transition to low carbon development" is not accurate. Carbon is a mandatory atom constituting life and many products and food of our everyday life. The final goal is not low carbon but carbon neutral meaning net zero emission in the atmosphere when maintaining economy et life. I understand that "low carbon" is preferred to "carbon neutral" since carbon neutrality is very hard to reach (despite thie objective) but it would be usefull to explain the expression. We need a carbon circular economy, not a carbonless economy. A low carbon development must be detailed. Suggestion : " Transition to a carbon neutral development" or "Transition to an almost carbon neutral development"	We have used low-carbon, low-emission development and carbon neutral development in the report. The concept of low carbon development is well understood in the literature as being consistent with development paths that imply low emission of GHG emissions.	Sylvain Nizou	CEA	France
5053	4	40	4	46	The entire listing of factors (starting "These include: the means by which...") appears to be very vague. What political economy forces? What behaviour change? Etc.	This statement has been edited.	Lina Hollender	n/a	Germany
22669	4	40	4	41	We recommand to clarify "the means by which services are being provided and for whom" as to what it refers to	This has been clarified by including some example; thank you.	Government of France	Ministère de la Transition éco	France
48487	4	40	4	45	Chapter 1, Executive Summary: When using a colon to list items as seen at the end of line 41, a semi-colon rather than a comma could be used to separate listed initiatives or points.	Thank you. The sentence has been edited out.	Carol-Anne Blenman	Violeta Consulting Services	Barbados
60705	4	40	4	43	What is meant by "political economy forces" (as additional drivers or enabling factors)?	Clarified to "the dynamics of political economy"	Lourdes Tibig	Climate Change Commission	Philippines
79953	4	40	4	46	Enabling factors also include mitigation of climate risks e.g. opportunities for mitigation-based climate adaptation	The idea is about factors that enable mitigation of risks and adaptation so that climate mitigation cannot be a factor for climate mitigation.	Mairi Dupar	Overseas Development Instit	United Kingdom (of Great Britain and Northern Ireland)
48489	4	43	4	44	Chapter 1, Executive Summary: Reword 'These factors...on' as 'These factors tend to vary within a given country context noting...'; Replace 'context' with 'contexts'.	reworded to "These factors tend to vary within a given country context, depending on prevailing social, economic, cultural and political contexts in particular"	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48491	4	45	4	46	Chapter 1, Executive Summary: Replace 'in the same and across different scales' with 'in and across different scales'.	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
9825	4		5		The highlight in every paragraph gives a concise statement that summarized the main idea of the report. Moreover, it also states the location of the report.	thank you	Government of Indonesia	Ministry of Environment and	Indonesia
37007	4		4		Full Form of the abbreviations not provided in first entry	thank you	Arun kumar Nayak	Bhabha Atomic Research Cen	India
4189	5	1	5	1	'dangerous' is a bit of a fighting term, a bit informal and vague. High risk?	This is the term directly from the UNFCCC Objective.	Marcel Wissenburg	Radboud University Nijmegen	Netherlands
4699	5	1	5	15	The consideration of power should be part & parcel of the economic framework: no economic model works in a power vacuum. Political economy considerations are arguably more important than economic metrics or instruments, and shifting the balance of power is crucial to transforming the economy away from emissions.	We have highlighted the role of political economy as a driver of, and barrier against climate mitigation.	Julia Steinberger	University of Lausanne	Switzerland
6849	5	1	5	15	Please consider italicising only IPCC assessment language.	Thank you. Suggestion has been noted.	Debra Roberts	EThekwini Municipality	South Africa
14387	5	1	5	1	If the language of the UNFCCC is invoked, ie "dangerous anthropogenic interference with the climate system" then that precise language needs to be used throughout, so the sentence should read: Accelerating mitigation to *prevent* dangerous etc....	Thanks corrected	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
27417	5	1	5	15	I welcome the breadth of social science perspectives mentioned here. (And wish it had permeated discussions of technologies.)	Thank you. We have now attempted to bring social science to the discussion of technologies including the need for technology sharing and also noting that access to technology vary between nations.	Nils Markusson	Lancaster University	United Kingdom (of Great Britain and Northern Ireland)
48493	5	1	5	1	Chapter 1, Executive Summary: Replace 'with' as 'within'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
50505	5	1	5	4	Is the 'medium agreement' well supported by section 1.6? Why is there "medium agreement" only?	The statement has been revised. We believe that section 1.6 supports this statement.	Anne Marie Treguer	CNRS	France
54519	5	1	5	15	"Accelerating mitigation to avoid or limit dangerous anthropogenic interference with the climate system will require integration of broadened assessment frameworks and tools that combine multiple perspectives, applied in a context of multi-level governance." As stated in line 4 and argued in this section, analyzing this challenge will require integrating multiple frameworks. However, the topline statement is accelerating mitigation will require integrating multiple frameworks. There is a missing premise that analysis of the challenge to gain understanding of the problem will be required in order to accelerate mitigation to avoid or limit dangerous anthropogenic interference with the climate system.	Point noted.	Government of United States of America	U.S. Department of State	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
61153	5	1	5	15	Noting the various frameworks included in this section - economic, ethical, sociotechnical, psychological and political - a biophysical capacities (planetary boundaries) framework is noticeably absent, e.g. planetary boundaries framework developed by Steffen, Rockstrom et al., 2009, later integrated into Raworth's (2017) Doughnut framework. Page 4 of the UNFCCC's founding document (1992) states that "policies and measures to deal with climate change should be cost-effective". But is it not time for us as a scientific body to recognise the primacy of biophysical capacities in these assessment frameworks. Even the recent Dasgupta Review - written by an economist and commissioned by the UK Treasury - accepts that the economy is entirely embedded with nature, not the other way around. Similar reports - e.g. the OECD's Beyond Growth (2020) report and the German Environment Agency's "Social Well-Being Within Planetary Limits" (2018) report recognise the primacy of nature. Therefore I would not only recommend a planetary boundaries framework to be included among these "multiple analytic frameworks" [line 5], but I would go further and argue that all other frameworks - including and especially the economic cost-benefit framework - should be situated within an overarching biophysical capacities framework. I think this would help to challenge the almost universal bias of nation states in prioritising cost-efficiency in climate policy. It also supports the aims stated in lines 26-38 of page 5 of achieving multi-level, polycentric governance structures, which could utilise a planetary boundaries framework to design sustainable and fair allocations by country, region and sector.	This is well expressed but our Q is whether this is specifically about analysis of Mitigation options. The Analytic Frameworks are about how to understand delivery of Mitigation, within the constraints of the Planetary Boundary associated with climate change risks, and as expressed in the Paris Agreement. The comment may be more appropriate to IPCC WG1 and II ?	Steven R Smith	CES, University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
65249	5	1	5	15	Excellent, thank you, clear and encompassing language for policy readers.	Thank you for your kind words	Lindsey Cook	Quaker United Nations Office	Germany
77097	5	1	5	1	The text refers to "dangerous" anthropogenic interference: based on observational evidence, use of the word "dangerous" is unjustified, inappropriate and unscientific.	dangerous is the word used in the UNFCCC and expresses widespread recognition of the risks involved in unmitigated climate change	Jim O'Brien	Expert Reviewer AR6 SOD W	Ireland
48495	5	2	5	2	Chapter 1, Executive Summary: Replace 'will require integration' as 'will require the integration'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
80349	5	4	5	7	"Analysing a challenge on the scale of fully decarbonising our economies requires integration of multiple analytic frameworks including approaches to risk assessment established across IPCC Working Groups": The failure in the recognition of the risk (physical and transition) is at the core of the problem and this should be reported. The problem is aggravated by the "resistance from established socio-technical structures" mentioned later in the paragraph.	Good point, clarified	Stefano Battiston	University of Zurich	Switzerland
48497	5	5	5	5	Chapter 1, Executive Summary: Insert 'the' before 'integration'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48499	5	6	5	6	Chapter 1, Executive Summary: Replace 'indicate' as 'promote'	Thank you for this comment. The economic frameworks are more descriptive than normative, and therefore they indicate a finding rather than promoting a direction.	Carol-Anne Blenman	Violeta Consulting Services	Barbados
50853	5	6	5	13	Can it be assumed that the list of frameworks in this paragraph is exhaustive and that these frameworks encompass/include/consider the role/importance and perspectives of "tools" like, for instance, education, One Health and research and innovation and their role in analytic frameworks/ risk assessments (this is particularly important in the developing countries, where the impacts of climate change will be felt disproportionately)? The frameworks listed in the paragraph are probably all-inclusive, but perhaps it can be stated more clearly?	In chapter, have tried to clarify what we mean by Analytic Frameworks in relation to this	Bianca Wernecke	South African Medical Research Council	South Africa
77705	5	6	5	7	The reference to "economic frameworks" (followed immediately after by "ethical frameworks") incorrectly implies that economic frameworks are separate from ethical frameworks. However, the mentioned economic frameworks rest on assumptions about the normative value of efficiency, i.e. that efficiency-enhancing policies (or repeated application thereof) produce a quasi-utilitarian or a quasi-Paretian distribution of "welfare" (qua preference-satisfaction). Both the quasi-utilitarian and the quasi-Paretian justifications are weak (unless welfare weights are used, in which case the quasi-utilitarian justification has some plausibility), though that is another story. The key point here is that separating welfare economic frameworks from ethics without noting the ethical basis of the former is misleading. Two other civil society trends deserve mention in this paragraph. One is the Extinction Rebellion protests that were highly politically salient in numerous countries such as the UK in 2019 (could be mentioned alongside the school strike discussion), and the other is the systemic / cross-issue organising and coalition building that has been done around the idea of a Green New Deal, especially in the US (which had a major influence on the US presidential primaries, has influenced the Biden administration, and continues to be a major force in US politics and beyond the US).	This comment technically correct and we wrestled with it, the point is that the first set take an aggregated view, whereas ethical literature tends to have disaggregated focus, hence renewed emphasis on "aggregated" for the first	Fergus Green	Utrecht University	Netherlands
17957	5	7	5	8	"Ethical Consideration" - should also include reference to indigenous groups and the role they play?	Accepted	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
48501	5	7	5	8	Chapter 1, Executive Summary: Replace 'choose' with 'select'; Replace 'to avoid' with 'which negate'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48607	5	7	5	8	Ethical frameworks involve more than distributional impacts, but also require attention to procedural and recognition justice, involving communities, households and individuals as well as 'income groups, countries and generations'	Expanded to better reflect the section	Lorraine Elliott	The Australian National University	Australia
48503	5	9	5	9	Chapter 1, Executive Summary: Replace 'explain' with 'evaluate'	I agree that they do evaluate but they also explain so have added "evaluate"	Carol-Anne Blenman	Violeta Consulting Services	Barbados
51865	5	9			The words transformation and transition have been used interchangeably even though that each imply different behavior and policy implications. The use of 'transformation' should be avoided as it has policy implications by requiring immediate policy actions. Transitioning to low-carbon economies can be achieved through planned interventions and by considering various transitioning options.	We have sought to clarify more consistently that transition is a process, but transformation is an end-point that involves a large degree of change. However, the literature does indicate that the Paris goals do imply such large changes in many respects	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
48505	5	11	5	11	Chapter 1, Executive Summary: Replace 'underline' with 'outline'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
48507	5	12	5	15	Chapter 1, Executive Summary: Insert 'of climate mitigation must be combined with these multiple frameworks' after 'understanding'; and Replace 'Together' with 'Collectively' in line 13.	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
4321	5	16	5	16	Add geographic component	True but The list reflects directly the 'Feasibility' framework of SR1.5	Alka Bharat	Maulana Azad National Institute of Technology	India
17959	5	16	5	25	Worth discussing what strategies countries can employ to manage change effectively to encourage a swift and seamless transition to sustainable practices?	Hard to address that in an Exec Sum	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
19077	5	16	5	25	The transition is a manifestation of strongly nonlinear, and non-ergodic dynamics. So, incremental and reflexive control is crucial. Therefore, emphasize the need for strengthening policy controls at the country level. The lower income countries lack effective control structures.	Accepted	Fred Amonya	Lyciar	United Kingdom (of Great Britain and Northern Ireland)
48509	5	16	5	16	Chapter 1, Executive Summary: Replace 'transition' with 'transitions'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
60707	5	16	5	18	Realms? Can we use a more apt word?	Thank you. We have avoided general use but it is a team relevant to broad collections of theories and regimes where that is clear.	Lourdes Tibig	Climate Change Commission	Philippines

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
6851	5	17	5	18	With robust evidence and high agreement, you should consider assessing your confidence in the evidence.	For consistency we decided to stick with the "Evidence, Agreement" ...	Debra Roberts	EThekwini Municipality	South Africa
48511	5	18	5	18	Chapter 1, Executive Summary: Join the two sentences such that 'Transitions typically are not smooth and gradual. They can be sudden and disruptive.' becomes 'Transitions typically are not smooth and gradual; yet, maybe somewhat sudden and disruptive.'	Agree that this should be one sentence. Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
70229	5	18			Transitions can be sudden and disruptive, and they can be smooth and gradual	Amended	Phillippe Tulkens	European Union (EU) - DG Re	Belgium
75881	5	18	5	18	I think this sentence is unclear. Is this based on experience? Or is this what you expect for future development? Please clarify.	It is both - decided to leave as is for Exec Sum	Jan Fuglested	CICERO	Norway
48513	5	19	5	19	Chapter 1, Executive Summary: Replace 'transition' with 'transitions'; Replace 'by 'lock-in'' with 'by technological 'lock-in''	Lock in can refer to institutions and social norms as well as technology. Have clarified this with the addition of "generated by" instead of "from"	Carol-Anne Blenman	Violeta Consulting Services	Barbados
22673	5	20	5	20	For the term "interaction" on this line, we suggest to add "complex" or "systemic interactions" in order to underline the holistic perspective and the need to grasp positive and negative feedbacks.	The statement has been revised	Government of France	Ministère de la Transition éc	France
65251	5	20	5	21	In connection with 'societal transition has generally increased', much work has been done at the UN Human Rights Council and especially by the UN Special Rapporteur on Human Rights and the Environment concerning good practice/sustainable climate action through 'rights-based approaches', in turn increasing chances for successful society transitions. Hope the IPCC research can integrate this sufficiently to support policy making.	A reference would be helpful, but we didn't find enough in academic literature to make it clear whether and how rights-based approaches would be central to mitigation beyond what is set out in Paris Agreement	Lindsey Cook	Quaker United Nations Office	Germany
48515	5	21	5	21	Chapter 1, Executive Summary: Replace 'commitment does not' with 'commitments do not'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
17961	5	26	5	38	How can successful ideas/policies be transmitted and adopted across different cities/levels of government?	Good question, not answerable in an Exec Sum except through references to the general points on policy and governance	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
48517	5	26	5	26	Chapter 1, Executive Summary: Replace 'Achieving global' with 'Achieving the global'	Thank you	Carol-Anne Blenman	Violeta Consulting Services	Barbados
61167	5	26	5	38	In addition to "purposeful and largely coordinated planning and decisions at many scales" it is imperative to include learning and evaluation. While learning is not the main focus of the paragraph, policy evaluation is essential to transitions in uncertain environments. Planning and decisions are based on many assumptions. In addition to planning, there should be evaluation and learning intergated into decisions in order to change course when decisions are off course, check assumptions, and validate decisions and plans that are working.	Statement has been edited; thank you.	Andrea Cristina Ruiz	Abdul Latif Jameel Poverty Action Fund	United States of America
85699	5	26	5	38	Suggest emphasising the need to coordinate between different levels of government, in the context of national commitments made under the Paris Agreement	The need for coordination is highlighted; thank you.	Government of Australia	Department of Industry, Science and Energy	Australia
86883	5	26	5	38	Chapter 8 also includes a robust discussion on multilevel and subnational climate governance.	Thank you. This has been reflected.	Meredith Keller	Yale University	United States of America
62095	5	30	5	30	Please add after "... making levels": "In the past, the action of interest groups has led to distortions of mitigation policy instruments that reduced their effectiveness. Under favourable lobbying constellations strong subsidy schemes for mitigation can emerge. " Reason: New literature brought into section 1.5.5.	We are not sure we understand this statment. However the role of power dynamics and political economy as a driver of and barrier against climate action is highlighted in the ES.	Axel Michaelowa	University of Zurich	Switzerland
6853	5	32	5	32	The concept of non-nation state actors as used here is confusing. Would suggest deleting it.	Thank you for your comment. Non-state actors are key in creating a robust and durable transition, and are a key part of the multi-level perspective (explained later in the chapter).	Debra Roberts	EThekwini Municipality	South Africa
50855	5	32	5	32	Consider including "educational institutions" in this list: "...range of non-nation state actors such as cities, businesses, civil society and educational institutions..." (or does that fall under "civil society"?)	There is no need for this. The list is not intended to be exhaustive.	Bianca Wernecke	South African Medical Research Council	South Africa
27509	5	34	5	38	Delete "Therefore, the governance required to address climate change has to navigate power, political, economic, and social dynamics at all levels of decision making. Institutions, ideas, and experimentation are key factors in shifting perceptions, engaging stakeholders, and building momentum for effective climate action at all scales of governance.", as this is not a policy neutral statement.	We do not see the statement on governance as policy prescriptive. The stament starting with institution has been revised based on your suggestion; thank you.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
6855	5	36		37	What sort of institutions, ideas and experimentation are you referring to? This is rather vague and confusing. Blanket advocacy for these without any form of the qualifier is dangerous given, for instance, concerns around experimentation involving solar radiation modification.	This sentence has been revised. Thank you	Debra Roberts	EThekwini Municipality	South Africa
7937	5	36	5	37	In addition to "Institutions, ideas, and experimentation" as key factors in shifting perceptions, engaging stakeholders, and building momentum for effective climate action", I would add the role of social and environmental justice movements as another key factor. This is also highlighted on page 20.	Suggestion rejected and it would not add anything to the statement.	Jevgeniy Bluwstein	University of Fribourg	Switzerland
50857	5	36	5	37	The key factors (institutions, ideas and experimentation) are very important in this paragraph - they could even warrant their own paragraph.	This statement has been edited as "ideas" was seen as too vague by some reviewers.	Bianca Wernecke	South African Medical Research Council	South Africa
48609	5	37	5	37	Encourage further engagement in the substance of the chapter with concepts of 'rights-holders' and 'duty-bearers' as well as stakeholders (see for example Submission of the Office of the High Commissioner for Human Rights to the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change, https://www.ohchr.org/Documents/Issues/ClimateChange/COP21.pdf) - see quote in SOD on page 1-10 from AR5	We have not explicitly mentioned right holders and duty bearers but we think that this idea is incorporated into the statements on ethics and justice which we have highlighted in the ES and other parts of the chapter.	Lorraine Elliott	The Australian National University	Australia
75883	6	1	6	2	This sentence is vague and as it is now, not needed in my view. If you want to make this point as an intro I think you need to be more precise and concrete.	Amended	Jan Fuglested	CICERO	Norway
15193	6	2	7	7	This is an incomplete citation of the relevant agreed texts of the UNFCCC and the Paris Agreement, and it is suggested to use the complete citation in accordance with the agreed texts. The details are as follows. 1) The global goal in UNFCCC was originally stated as "prevent dangerous anthropogenic interference with the climate system." instead of "avoid". 2) The 2 °C and 1.5 °C targets of the Paris Agreement are not a "mitigation aim". It is suggested to delete "mitigation" in this connection. 3) The original statement of the Paris Agreement target, which is not fully quoted, should read "Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change". The underlined part is missing.	Addressed, thank you	Government of China	China Meteorological Administration	China

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
54521	6	2	6	7	The first paragraph of the introduction lays out that impacts of climate change will get worse without strong mitigation; the UNFCCC objective to, "avoid dangerous anthropogenic interference"; and then states that Article 2 of the Paris agreement established the "mitigation aim" of holding temperatures to well below 2°C. "Mitigation aim" is a strange way to describe the Article 2 goal. Article 2 is a long-term temperature goal, and the "mitigation aim" is instead established in Article 4.1 which describes the mitigation Parties are aiming to achieve in order to achieve the long-term temperature goal in Article 2. Specifically, Article 4.1 states "In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century." Suggest rewording to instead read, "Reflecting this, the Paris Agreement (UNFCCC 2015) established the long-term temperature goal of 'holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C', which Parties aim to achieve by undertaking rapid reductions so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century."	We have amended accordingly	Government of United States of America	U.S. Department of State	United States of America
6857	6	3	6	5	This sentence is not clear.	Addressed, thank you	Debra Roberts	EThekwini Municipality	South Africa
78259	6	3	6	3	Please note that the WG II will not be approved before submission of the WG III final draft under current plans. And more specific reference to locations within other WG reports are needed.	We have avoided ref to WGII SPM, and sought to give more specific references to sections	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
14389	6	4	6	5	It is important to quote the UNFCCC correctly: The UNFCCC sets out the ultimate objective to "prevent dangerous anthropogenic interference with the climate system".	Accepted	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
74059	6	4	6	4	Word missing in sentence. Replace "agreed the global Objective to" with "established the global Objective to".	Addressed, thank you	Beate Antonich	Center for Climate Change, Energy and Environment	United States of America
74061	6	5	6	5	Specify the verb "reflecting" by adding "with greater clarity" so it reads: "Reflecting this with greater clarity,"	Intro edited	Beate Antonich	Center for Climate Change, Energy and Environment	United States of America
14391	6	8	6	8	This would read much more logically as: Previous IPCC Assessments highlighted the continued rise of GHG emissions, despite the spread of climate mitigation policies...	Addressed, thank you	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
27511	6	8	6	12	The sentence should be based on the data presented in Figure 1.2. The time periods used in the text are not presented in the Figure, therefore consistency should be allowed.	Clarified in section 1.3	Eleni Kaditi	Organization of the Petroleum Producers	Austria
12799	6	10	6	11	what is this cf stands for	Clarified	Amanullah Amanullah	Department of Agronomy, The National Institute of Food Cereals	Pakistan
51889	6	10	6	10	2018/9, not clear if it is 2018 or 2019 or both. Clarify.	Thank you	Government of Saudi Arabia	Sustainability Advisor to the Ministry of Environment, Water and Climate Change	Saudi Arabia
51891	6	10	6	10	cf not clear	Clarified	Government of Saudi Arabia	Sustainability Advisor to the Ministry of Environment, Water and Climate Change	Saudi Arabia
51893	6	10	6	10	This estimate is inconsistent with the estimate cited in the TS (3-14, L10-11) "The average rate of emission growth was 1.3% per year between 2010 and 2018, compared to 2.3% per year in the previous decade"	These data covered different time period, both are drawn from the EDGAR dataset. However, referred forward to section 1.3	Government of Saudi Arabia	Sustainability Advisor to the Ministry of Environment, Water and Climate Change	Saudi Arabia
54523	6	10	6	10	Revise: to 2018/9	Thank you	Government of United States of America	U.S. Department of State	United States of America
12801	6	11	6	11	2008-13), thus. Remove space between 2008-13) and thus	Thanks	Amanullah Amanullah	Department of Agronomy, The National Institute of Food Cereals	Pakistan
14393	6	11	6	11	Should "global" read "atmospheric"?	Accepted	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
14395	6	11	6	13	Why the focus on CO2 rather than GHG?	For intro, decided to cut this	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
50507	6	12	6	12	Figure 1.2 is cited before figure 1.1.	The ordering has been corrected in the process of our restructuring.	Anne Marie Treguier	CNRS	France
81137	6	12	6	15	It's unclear and confusing in my view to refer only to CO2 here, rather than all GHGs (even if they play different roles in achieving mitigation outcomes). I.e. net-zero CO2 AND deep reduction in non-CO2 emissions. Also temperature reflects cumulative CO2 emissions PLUS the warming from the concentration of non-CO2 emissions at that point.	For intro, decided to cut this	Andy Reisinger	Ministry for the Environment	New Zealand
85701	6	12	6	12	Consider changing order of figures, where Figure 1.1 becomes Figure 1.2 and vice versa. The text refers to figure 1.2 prior to referring figure 1.1.	The ordering has been corrected in the process of our restructuring.	Government of Australia	Department of Industry, Science and Energy	Australia
22675	6	13	6	13	We suggest to give a clear definition of the term "net zero emissions" for its first use in the chapter	Referred to Glossary and FAQ	Government of France	Ministère de la Transition écologique et solidaire	France
12803	6	15	6	15	(chapter 3) try to write Chapter with C capital in the whole document for uniformity	Thank you	Amanullah Amanullah	Department of Agronomy, The National Institute of Food Cereals	Pakistan
75885	6	16	6	18	re "need for more ambitious mitigation": I think this should be related to goals and ambitions. As it is now, it is imprecise and also not reflecting the SRs well.	Couldn't find concise enough for Intro	Jan Fuglestedt	CICERO	Norway
78261	6	17	6	17	an example of policy prescriptive language that may need attention.	Noted	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
86889	6	18	6	20	Capitalize the SR15 report for consistency with the way the other SRs are formatted.	Thank you	Meredith Keller	Yale University	United States of America
9039	6	21	6	21	Add the reference for the IPCC report 'Special Report on Climate Change and Land'.	thank you	Emmanuel Garbolino	Climapact Data Science	France
70111	6	21	6	21	(SRCLL) + (IPCC 2019b) - to be congruent with SR1.5 & SROCC.	thank you	Rayner Andersen	Department of Fisheries and Aquaculture	Canada
4323	6	23	6	24	ADD ... 'and National'	Context changed	Alka Bharat	Maulana Azad National Institute of Technology	India
75887	6	23	6	23	I guess you here mean AR6 WGIII	Yes	Jan Fuglestedt	CICERO	Norway
85171	6	25	6	28	One of the main ways in which the mitigation landscape has changed is that cities now play a increasingly larger role in national scale policies. Cities have shown to be extremely nimble, responsive, and innovative in exploring alternative mitigation strategies. The importance of cities has also become clearer since AR5. Since AR5, the IPCC approved a Special Report on Cities and Climate Change for the 7th Assessment Cycle, and the UN approved the New Urban Agenda and a standalone SDG on sustainable cities and communities (SDG 11).	Explicitly mentioned in our Exec Sum and Intro - and urbanisation added in a section title	Karen Seto	Yale University	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
45721	6	26	6	27	Please write "[...] and the UN 2030 Agenda for Sustainable Development with its 17 SDGs [...]" instead of "[...] and the SDGs [...]". Rationale: Paris Agreement and 2030 Agenda (UN, General Assembly, A/RES/70/1, https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E) are the agreed UN documents, while SDGs and "limiting the increase in global mean temperature to well below 2°C, pursuing a warming limit of 1.5°C" are goals within these agreements. General Comment: This should also be changed in further introducing paragraphs or paragraphs with overall statements (see e.g., in ch. 1 p. 9, line 27, p. 11, line 26, p. 59 line 43).	Addressed, first time, but space constraints make it inappropriate to repeat in full every time	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
6859	6	27	6	27	The exact wording is "the Paris Agreement" not "the Paris Climate Agreement". Please check the entire chapter and address it accordingly.	Thank you	Debra Roberts	EThekweni Municipality	South Africa
14397	6	27	6	27	The correct title is simply "the Paris Agreement", not "the Paris Climate Agreement".	Thank you	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
74063	6	28	6	28	delete "broader" so to be consistent with the next sentence, line 30 which reads "requires a sharpened focus on the impact of human activity" The latter makes clear that the agenda encompasses all human activity broadly. Page 11 Line 34 captures "the broader context" well.	Thank you	Beate Antorich	Center for Climate Change, Energy and Sustainability	United States of America
50509	6	29	6	29	The concept of "Anthropocene" also brings to mind other issues beyond climate change (loss of biodiversity, pollution...) Perhaps these should be mentioned here?	We do mention some of these, but the core focus is mitigation	Anne Marie Treguier	CNRS	France
75889	6	29	6	29	You introduce the concept "Anthropocene" here. But I am not sure what it adds here.	We think it is useful and the meaning is clear	Jan Fuglestedt	CICERO	Norway
12805	6	30	6	30	2018a; p.52 & 53). No need to give page number inside text. Remove it.	text edited.	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
43387	6	32	6	32	Please add the phrase "historical responsibility" after the word "nationally..."	Not here, but we do in sections 1.4 and 1.7	sadegh zeyaeyan	Head of national center for climate change and environment	Iran
43389	6	32	6	32	Delete ", and multi-level governance"	Thank you. Noted	sadegh zeyaeyan	Head of national center for climate change and environment	Iran
50293	6	32	6	32	Please add the phrase "historical responsibility" after the word "nationally..."	Not here, but we do in sections 1.4 and 1.7	Government of Iran	Islamic Republic of Iran Meteorological Organization	Iran
50295	6	32	6	32	Delete ", and multi-level governance"	Thank you. Noted	Government of Iran	Islamic Republic of Iran Meteorological Organization	Iran
22677	6	33	6	33	Could usefully add a sentence to clarify that successful mitigation of climate change is also critical to successful protection of biodiversity as highlighted by the global assessment of IPBES in 2019	PBES referenced	Government of France	Ministère de la Transition écologique et solidaire	France
17963	6	34	6	35	"and only then reducing under the impact of COVID-19 pandemic" - might be worth emphasising this as a transient and short lived effect	This has now been covered	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
47719	6	34	6	35	How significant emission decreasing due to pandemic COVID-19?	This has now been covered	Yulizar Yulizar	Universitas Pertamina	Indonesia
47721	6	34	6	35	How significant emission decreasing due to pandemic COVID-19?	This has now been covered	Yulizar Yulizar	Universitas Pertamina	Indonesia
50511	6	34	7	18	This text is a guide to the other chapters, similar to section 1.10. It is useful to have this text here, but perhaps it could start by an introductory sentence, page 6 line 34, about the general scope of WGIII, or its originality compared with AR5.	Text has been edited. Thank you.	Anne Marie Treguier	CNRS	France
51895	6	34	6	34	is it 2018 or 2019. Not clear.	This referred to the recording years, so there is cross over in the data. Have corrected to 2019 as the most recent date	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
79883	6	34	6	34	It would have been ideal to develop scenarios of post COVID recovery and its impacts on emissions.	We have to assess the literature	Carlos Ruiz Garvia	UNFCCC	Panama
50513	7	2	7	2	Figure 1.6 is cited before figures 1.1, 1.3, 1.4 and 1.5	True but in Intro it does seem relevant to cite early	Anne Marie Treguier	CNRS	France
11095	7	3	7	7	Overall I like this, but to be consistent with chapter 14 perhaps it could even more strongly suggest that a rationale for global collective action derives from the differences in capacities across countries.	Noted	Anthony Patt	Text has been edited. Thank you	Switzerland
61169	7	3	7	3	Implied but unclear whether "climate action" is in reference to climate mitigation. If the sentence includes "differences in responsibilities", then "climate action" must be "mitigation" but a clarification could be helpful.	This statement has been removed during our restructuring. Thank you for highlighting we will keep this in mind as we progress with edits	Andrea Cristina Ruiz	Abdul Latif Jameel Poverty Action Fund	United States of America
74737	7	8	7	14	It is being suggested that to transfer knowledge of renewable technologies and ability to get access to and use low-carbon technologies across the world from developed countries to developing countries to expand carbon reduction.	thank you.	Mahnaz Ahmadi Namin	Meteorology Organization of Iran	Iran
77171	7	9	7	11	The sentence in the indicated lines reports a conclusion, while it is not clear how it correlates with the observation on the large reductions in the cost of widely-available renewable energy technologies. Enabling the provision of services with lower energy demand is independent on the source of such lower energy... At least, this is enabled, along with the "other behavioural changes", by the availability of end-use technologies which are more efficient, thus less energy-intensive.	Intro was shortened - not space for this	Giacomo Grasso	ENEA	Italy
65977	7	10	7	11	Renewable technologies do not lower energy demand, they lower GHG emissions. Energy demand is lowered through lifestyle changes and energy efficient technologies	Clarified	Yamina Saheb	OpenExp	France
12807	7	13	7	13	world (Chapter 4, 15, 16). Write as Chpters	Thank you	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
6861	7	14	7	14	It might be helpful to be explicit about what cities, businesses, and numerous non-state transnational alliances have emerged as important players	Think too much for Intro	Debra Roberts	EThekweni Municipality	South Africa
48611	7	15	7	18	Paragraph is vague and insubstantial	This has been corrected in our restructuring process, thank you	Lorraine Elliott	The Australian National University	Australia
54525	7	15	7	18	Paragraph appears to be incomplete.	This has been corrected in our restructuring process, thank you	Government of United States of America	U.S. Department of State	United States of America
80351	7	15	7	18	Passage: "Analytically, along with continued development of concepts, models and technologies, there have been numerous insights from both successes and failures of mitigation action. This can inform both policy design and the political realisation of more ambition. However, policies and investments are still clearly inadequate to put the world in line with the PA's aims (Chapter 15)". Since the Chapter 15 is mentioned here, more specifically here there could be a reference to the failure in the recognition of risks from inaction and from delayed and disorderly transition, which is one of the drivers of the inaction, along with the "resistance from established socio-technical structures" mentioned above.	Intro shortened - not space here	Stefano Battiston	University of Zurich	Switzerland
79955	7	17	7	17	Are you missing the word 'current' before 'policies and investments'?	The phrase "to date" should highlight this. Thank you.	Mairi Dupar	Overseas Development Institute	United Kingdom (of Great Britain and Northern Ireland)
42957	7	18	7	18	PA is not previously defined in this Chapter	Clarified this as the paris agreement in the first paragraph thank you	Kurt Kornelsen	Ontario Power Generation	Canada
50515	7	18	7	18	The abbreviation PA for the Paris Agreement is not used consistently (here it is used before being defined, then it is defined many times later in the chapter).	Clarified this as the paris agreement in the first paragraph and have corrected this, thank you	Anne Marie Treguier	CNRS	France
66747	7	18	7	18	Please also cite Chapter 13 since policy is referred to	Thank you	Navroz Dubash	Centre for Policy Research	India

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
74065	7	18	7	18	introduce the acronym Paris Agreement (PA) here. It is repeated again on page 9 line 5 and line 8, and on page 10 line 28.	Thank you	Beate Antonich	Center for Climate Change, E	United States of America
85703	7	18	7	18	Suggest spell out acronym PA. "Paris Agreement" has been used in line 5 of page 6 and suggest adding PA in that location.	Thank you	Government of Australia	Department of Industry, Scie	Australia
75891	7	19	7	20	I find this sentence not policy neutral as written now. You need to relate this to adopted goals.	Changed	Jan Fuglestedt	CICERO	Norway
78263	7	19	7	20	needs a scientifically neutral framing, an example of policy prescriptive language that may need attention.	Changed	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
83005	7	19	7	23	1.5 and 2C are part of one PA "long-term temperature goal" (LTTG, singular). The enormous uncertainties in the WG1 carbon budget and the many substantial changes in the WG1 methodology (between SR1.5 and AR6) might warrant to avoid the countdown language used here ("1-3 decades")	Good point though we are trying to set the numbers in an easily understandable context.	Geden Oliver	German Institute for Internat	Germany
46965	7	20	7	23	This sentence is misleading as written. It must include the information that these carbon budgets include the prospect of global-scale negative emissions later this century. Governments and other stakeholders cannot make informed decisions about mitigation actions without having all the assumptions and mechanisms of pathways, and the limits of carbon budgets, presented explicitly and clearly.	None of the IPCC scenarios involve a pace of negative emissions that would negate this sentence, without overshoot	Genevieve Guenther	Tishman Enviorment and De	United States of America
50517	7	20	7	20	Perhaps the notion of "carbon budget" should be explained somewhere in this chapter?	We have not done this explicitly as we see no need to do so.	Anne Marie Treguier	CNRS	France
54527	7	20	7	23	Second sentence of this paragraph is very confusing; appears to be missing something. "From before 2020" does not make sense.	Revised to "The remaining "carbon budgets" associated with 1.5°C and 2°C temperature targets equate to about 1 (1.5°C) to 3 (2°C) decades of current emissions, beginning before 2020 " for clarity	Government of United States of America	U.S. Department of State	United States of America
75873	7	20	7	20	Good that you write 'remaining' but you don't need " " around carbon budgets. It as a defined term. See glossary.	Thank you	Jan Fuglestedt	CICERO	Norway
75893	7	20	7	20	Good that you write 'remaining' but you don't need ' ' around carbon budgets. It as a defined term. See glossary.	Thank you	Jan Fuglestedt	CICERO	Norway
75895	7	20	7	23	Please coordinate further with WGIII Ch3 on cumulative carbon until net zero for the various temperature levels and with WG1 Ch5 on their numbers for remaining carbon budgets. Coordination activities are taking place to use WGI Remianing carbon budgets and WGIII's cumuative carbon yo net zero in a consistent manner. WGIII TSU contact on this is Alaa Al Khourdajie.	Have done thanks	Jan Fuglestedt	CICERO	Norway
14399	7	21	7	21	"increases" should read "limits".	Amended	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
78265	7	21	7	21	language needs to align precisely with Chapter 3	Done	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
14401	7	23	7	24	Please rephrase the sentence "The greater the inertia... will continue to accumulate...". It is difficult to read, and I'm not sure it is correct (the inertia... in obstacles to mitigation?); delete "that")	Split this into two sentences. "The greater the inertia (including political) in emission trends and obstacles to mitigation, the more that CO2 will continue to accumulate. This will increase the scale of costs and risks also associated with having to subsequently remove CO2 from the atmosphere, particularly to achieve the lower	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
12809	7	26	7	26	(Hilaire et al. 2019)(Chapter 3). Write as (Hilaire et al. 2019). Remove (Chapter 3).	Thanks	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
22679	7	26	7	27	In this sentence, we recommend to clarify the term "terrestrial carbon sinks". For example maybe replace it with "and risks that terrestrial carbon sinks may be reduced or transformed into sources of emissions."	This is a very compressed Intro chapter	Government of France	Ministère de la Transition éc	France
75897	7	26	7	27	Good point to make, but the reference to WGI needs a check.	Cant quite see the issue - & we cross ref to Ch3	Jan Fuglestedt	CICERO	Norway
12811	7	28	7	28	(IPCC 2019b) (WGI). No need to write (WGI) here.	Thanks	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
54529	7	28	7	31	"These factors and the associated literatures" -- should be one or the other not both. Add "the need for" so it reads "point to the need for". Eliminate colon.	The factors have associated literature which we are pointing to. I have revised this to be clearer. "Overall, the literature associated with these factors points to the need for a more dynamic consideration of intertwined challenges concerning the transformation of key GHG emitting systems"	Government of United States of America	U.S. Department of State	United States of America
51897	7	32	7	35	Rephrase. "to globally achieve" And "societal transformation IN the face"	thank you	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
80893	7	34	7	35	last line of paragraph is grammatically incorrect. Should probably be "to globally achieve development ...transformation in the face of climate change"	thank you	Heinz Wittenbrink	FH Joanneum University of A	Austria
54531	7	38	7	38	The end of Section 1.1 should include an overview of the rest of Chapter 1, not just an overview of the WGIII report. The subsections in Chapter 1, as currently written, do not flow well from one to another. Section 1.4 especially feels out of place. Why is this not part of the "evolving context" section?	thank you	Government of United States of America	U.S. Department of State	United States of America
12813	7	39	7	39	as analysed in (Lamb et al., Submitted). No need to cite unpublished or submitted articles. Most of the times the authors cite their own work.	Published	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
9041	7		7		If possible move the footnote of page 7 to the footnote of page 6.	This footnote has been moved in the course of our restructuring.	Emmanuel Garbolino	Climpact Data Science	France
12815	8	1	8	2	the text in Figure 1.1 is looking dim need to improve its quality	Moved and Improved	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
46987	8	1	8	2	Figure 1.1 of low resolution and difficult to read with the colours used	Moved and Improved	Viktoria Spaiser	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
47313	8	1	8	2	figure 1.1 needs to be more illustrated to shows clearly the structure of AR6 of the mitigation report because all contents are not readable	Moved and Improved	Khaled Mohamed Madkour	Ain Shams University, Cairo,	Egypt
47859	8	1			Suggesting to use high-resolution figures in Chapter 1, as some figures are not readable with blurry words	Moved and Improved	Yuan Peng	The Australian National Univ	Australia
51899	8	1	8	1	Figure 1.1 is useful, but blurry	Moved and Improved	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
70231	8	1	8	2	The white on blue is suboptimal for readability.	Moved and Improved	Philippe Tulkens	European Union (EU) - DG Re	Belgium
85707	8	1	8	1	Suggest improving the quality of the figure 1.1. It is difficult or not possible to read some parts.	Moved and Improved	Government of Australia	Department of Industry, Scie	Australia
6863	8	2	8	2	It is quite difficult to read the texts in Figure 1.1.	Moved and Improved	Debra Roberts	EThekwini Municipality	South Africa
86877	8	4	12	32	Section 1.2 could mention the UNFCCC's and IPCC's growing emphasis on urban areas and cities as evidenced by their mention in the Preamble in the Paris Agreement, as well as by the upcoming Special Report on Cities for AR7.	This strengthened throughout chapter	Meredith Keller	Yale University	United States of America
75899	8	6	8	7	Please check BAU. I dont find that in AR5 WGIII SPM, WGI SPM or in AR5 SYR. See also current glossary about the use of the term BAU.	Thank you. This has been fixed now	Jan Fuglestedt	CICERO	Norway

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
20131	8	9	8	19	Heavy criticism over BAU scenarios (in AR5), see: - Grant, N., Hawkes, A., Napp, T., & Gambhir, A. (2020). The appropriate use of reference scenarios in mitigation analysis. <i>Nature Climate Change</i> , 10(7), 605-610. - Hausfather, Z., & Peters, G. P. (2020). Emissions—the ‘business as usual’ story is misleading.	Clarified	Nikas Alexandros	National Technical University	Greece
85705	8	9	8	17	Suggest clarification: Does ‘baseline scenario’ refer to RCP 8.5 (or possibly SSP5-8.5)? If so it would be useful to state that.	Clarified	Government of Australia	Department of Industry, Science and Resources	Australia
66179	8	10	8	17	There is a need in the report to present and discuss the most accurate scientific data in a way that distinguishes extreme weather events from climate change, as otherwise it is a political document. It is risky to assume that the science was all done and dusted in previous reports and that the positions adopted are immune to further scientific enquiry. A better understanding of the complexity of atmospheric physics disproves climate sensitivity claims of 5°C (Spencer and Braswell, 2011; Bates, 2016). References Bates, JR (2016), Estimating climate sensitivity using two-zone energy balance models, <i>Earth and Space Science</i> , 3, 207–225, doi:10.1002/2015EA000154. Spencer, RW; Braswell, WD. (2011). "On the Misdiagnosis of Surface Temperature Feedbacks from Variations in Earth's Radiant Energy Balance" <i>Remote Sens.</i> 3, no. 8: 1603-1613. doi.org/10.3390/rs3081603	These are WG1 not WG3 issues	Donal O'Callaghan	Teagasc (retired member)	Ireland
43499	8	12	8	12	It is suggested that as the energy section defines along with AFOLU, the industrial section processes should be included in the paragraph due to the role of this section in CO2 emission.	noted thanks	sadegh zeyaeayan	Head of national center for climate change	Iran
50405	8	12	8	12	It is suggested that as the energy section defines along with AFOLU, the industrial section processes should be included in the paragraph due to the role of this section in CO2 emission.	noted thanks	Government of Iran	Islamic Republic of Iran Meteorological Organization	Iran
75901	8	17	8	17	Please specify AR5 WGIII	Done where relevant	Jan Fuglestedt	CICERO	Norway
12817	8	20	8	20	scenarios (p.17 SPM WGIII AR5). No need to write page number here. If it is refence then give year of publication.	noted thanks	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
80177	8	21	9	15	This section is missing a discussion of SRM in the context of reducing climate impacts in the event of an overshoot. In context of the extreme challenges to mitigation, the rapidly closing window for action, and the profound impacts of continued warming on human and natural systems, this omission of policy-relevant information is misguided and prejudicial. Instead, incorporating the conclusions of SR1.5 would be appropriate: "If mitigation efforts do not keep global mean temperature below 1.5°C, SRM can potentially reduce the climate impacts of a temporary temperature overshoot, in particular extreme temperatures, rate of sea level rise and intensity of tropical cyclones, alongside intense mitigation and adaptation efforts." and "SAI is the most-researched SRM method, with high agreement that it could limit warming to below 1.5°C" (SR1.5, Ch4, Cross-chapter box 10)	This is addressed in section 4	Kelly Wanser	SilverLining	United States of America
51867	8	25			The paragraph uses SR1.5 and the pathways limiting warming to 1.5 degrees Celsius solely for the discussion and to create urgency to shift investments and strategies for physical capital, and to bring preference to avoiding CO2 removal and solar radiation modification. It is crucial to always give all the options to decision makers and provide objective comparison between all possible pathways.	In general we agree but this para was specifically about SR1.5 report	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
50525	8	26	8	26	Perhaps the concept of "overshoot" should be defined somewhere in this chapter?	clarified on first use	Anne Marie Treguier	CNRS	France
9827	8				Fig. 1.1 The figure is in a very low pixel quality. It should be changed with a clearer figure.	Moved and Improved	Government of Indonesia	Ministry of Environment and Forestry	Indonesia
70233	8		28		Comment on organisation of sections 1.2-1.4. While the underlying material is good, the sections should be organised differently. Some of the current Section 1.3 is commentary on the state of the world (1.3.2-1.3.4 Inc CC Box 1). This would be better placed in Section 1.2. The rest consists of sections that explain the approach taken across the report (1.3.5 & 1.3.6). This would be better placed in what is currently Section 1.4 (i.e. sub-sections explaining the report's approach to scenarios & pathways, feasibility, and sustainable development).	Reorganised, though nothing was ideal	Phillippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
27513	9	2	9	4	Delete "Since most physical capital (e.g. power plants, buildings, transport infrastructure) involved in GHG emissions is long-lived, the timing of the shift in investments and strategies will be crucial (p.18 SPM (IPCC 2014a)." as this paragraph refers to the recent IPCC SRs.	Moved to previous para	Eleni Kaditi	Organization of the Petroleum Producers	Austria
50519	9	2	9	4	This sentence is based on AR5, it is not "A key message from recent Special Reports". Should it be moved in the previous paragraph?	Moved to previous para	Anne Marie Treguier	CNRS	France
65255	9	2	9	15	It is not clear in this sentence that these approaches - CO2 removal-at-scale and SRM - are not yet proven-to-scale or even proven (SRM). This should be clear in any reference (as in the SR1.5C) as uninformed policy makers may not understand that a significant part of the danger involved.	Addressed in section 1.4	Lindsey Cook	Quaker United Nations Office	Germany
75907	9	3	9	4	Please indicate WGIII	Thank you	Jan Fuglestedt	CICERO	Norway
4085	9	5	9	10	The two sentences seem redundant.	Thank you for your comment, we have dealt with these redundancies in the process of our restructuring.	Tatsuki Ueda	National Agriculture and Food Organization	Japan
10195	9	5	9	10	Duplication - roughly the same sentence appears twice in succession	Thank you for your comment, we have dealt with these redundancies in the process of our restructuring.	Gary Kendall	Nedbank	South Africa
22681	9	5	9	10	This sentence is repeated: "The Nationally Determined Contributions (NDCs) as declared under the Paris Agreement (PA) suggest global GHG emissions between 52 and 58 GtCO2eq yr-1 in 2030 (IPCC 2018a), similar to the 58 (±5.8) GtCO2eq GHG emissions in 2018 (Chapter 2)."	Thank you for your comment, we have dealt with these redundancies in the process of our restructuring.	Government of France	Ministère de la Transition écologique et solidaire	France
50521	9	5	9	10	A sentence is repeated twice here.	Thank you for your comment, we have dealt with these redundancies in the process of our restructuring.	Anne Marie Treguier	CNRS	France
80179	9	5	9	15	This passage buries the policy-relevant lede underneath overly technical discussion of NDCs. The paragraph should be restructured so that the first (topic) sentence is the key takeaway: "The NDCs are not sufficient to meet the stated aim of the Paris Agreement to limit warming to 1.5°C. They could only do with either rapid transition to net negative emissions (subsequent CO2 removal (CDR) at a scale exceeding emissions) and/or Solar Radiation Modification (SRM)."	Thank you for this. We have reorganised this paragraph in light of this comment	Kelly Wanser	SilverLining	United States of America
80181	9	5	9	11	The first two sentences of this paragraph contain the same information.	Thank you. This has been fixed now.	Kelly Wanser	SilverLining	United States of America
80895	9	5	9	9	The second sentence repeats the first sentence nearly literally.	Thank you for your comment, we have dealt with these redundancies in the process of our restructuring.	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
25063	9	6	9	6	This should be 59 Gt in line with Ch 2	Thank you. This has been fixed now.	Minal Pathak	WGIII TSU, Ahmedabad University	India

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
62037	9	6	9	6	The estimate of IPCC 2018 has changed, due to the impact of GWPs AR6. It is inconsistent with the estimate presented in the SPM and Tech. Summary. The estimates needs to be adjusted for the same GWPs.	Thank you. This has been fixed now.	Michel den Elzen	PBL Netherlands Environment	Netherlands
27515	9	7	9	10	Delete "The emission contributions as submitted under the Paris Agreement (PA) suggest global GHG emissions between 52 and 58 GtCO2eq in 2030 (IPCC 2018a), which is at the same level of similar to the 58 (±5.8) GtCO2eq of global GHG emissions in 2018 (Chapter 2).", as this is a repetition to the previous sentence.	Thank you. This has been fixed now.	Eleni Kaditi	Organization of the Petroleum	Austria
50523	9	10	9	13	Do the NDCs require "rapidly ramp up" or "rapid transition to negative emissions", or both, to meet the aim of the Paris Agreement? It does not seem completely clear in this paragraph.	Changed	Anne Marie Treguier	CNRS	France
54533	9	10	9	10	"ambition" is too non-specific.	Struggled to find better words	Government of United States of America	U.S. Department of State	United States of America
14403	9	11	9	11	"The NDCs are not sufficient to meet the stated aim of the Agreement". This sentence could be deleted, as it merely reiterates what is said in the sentences before it. Alternatively, the sentence should be rephrased and corrected to follow logically on, eg "This means that the initial NDCs are not sufficient to meet the global goals of the Paris Agreement, or they could only do so with rapid transition etc..."	Amended	Joanna Depledge	Centre for Environment, Energy	United Kingdom (of Great Britain and Northern Ireland)
15195	9	11	9	13	The statement here is inaccurate or too absolute. It is suggested to change "The NDCs are not sufficient to meet the stated aim of the Agreement. or they could only do with rapid transition to net negative emissions" into "The NDCs are not sufficient to meet the long-term temperature goal stated in the Agreement".	noted	Government of China	China Meteorological Administration	China
75903	9	13	9	15	You may also mention the geophysical aspects of SRM here; See WGI.	noted	Jan Fuglested	CICERO	Norway
80183	9	13	9	15	SR1.5 also contains a discussion of SRM, and this line should reflect that fact. See SR15 Cross-Chapter Box 10	main points brief in 1.4	Kelly Wanser	SilverLining	United States of America
83007	9	14	9	14	When talking about pathways, it's better to use "carbon dioxide removal" instead of "negative emissions", to avoid confusion with "net negative emissions" (see also Glossary)	Reference to negative emissions has been removed from here	Geden Oliver	German Institute for International	Germany
65253	9	18	9	21	Thank you for ensuring financial 'cost' and cost to life and livelihoods are engaged in the same sentence, as too often 'cost' is viewed only in monetary terms which is dangerous when addressing and existential threat.	Thank you for this comment!	Lindsey Cook	Quaker United Nations Office	Germany
10485	9	23	9	27	doublon ?	Thank you. This has been fixed now.	Philippe Waldteufel	CNRS	France
49781	9	27	9	30	This statement is a simplistic analysis that feeds into climate denial arguments . Frequently, energy costs are cheaper, supplies more reliable and more accessible with climate friendly technology. Wind and solar power sources are less likely to be controlled by multi-national corporations, they are less centralized and more horizontally/democratically available to communities (note that mega-projects like hydro-electric dams are an exception to this). Further, it is likely that the benefits of climate mitigations will far outweigh the cost of higher energy bills as health outcomes improve and as the costs and impacts from climate induced crisis disproportionately effect poor people.	noted	Chloe Hartley	Tsleil-Waututh Nation	Canada
65257	9	27	9	29	These sentences sounds contradictory as 'run counter' can be read as 'happening against' - At the same time, some climate mitigation policies can run counter to 28 sustainable development and eradicating poverty. Examples include synergies between climate policy 29 and improved air quality, reducing premature deaths and morbidity - - mitigation policies which improve air quality and reduce premature deaths would support, rather than 'run counter' to SD and eradicating poverty?	we have reworded this for clarity.	Lindsey Cook	Quaker United Nations Office	Germany
70235	9	27	9	28	Better to say that mitigation policies alone do not automatically contribute to sustainable development and eradicating poverty. Focusing on mitigation as potentially 'running counter' seems to too strong. The possibility that of negative outcomes is not unique to mitigation policies. It can apply to any public or private intervention that is not aiming to improve sd/poverty outcomes.	we think we put enough relevant caution around this issue	Phillippe Tulkens	European Union (EU) - DG Re	Belgium
12819	9	29	9	29	morbidity (AR5 WGIII Fig SPM.6). Better to write Figure in full to maintain the uniformity.	Noted	Amanullah Amanullah	Department of Agronomy, Thi	Pakistan
86201	9	29	9	29	Please consider to add a link toward WG1 chapter 6 (sections 6.6.3 and 6.7.3), which discusses impact of decarbonization on air pollution (not on health though).	Accepted	Sophie Szopa	LSCE	France
70237	9	30		34	Also mention the tradeoffs, eg that large-scale Re/afforestation and biofuels can impact food security, biodiversity, etc	Text has been revised and some changes made where relevant	Phillippe Tulkens	European Union (EU) - DG Re	Belgium
45681	9	33	9	34	At the end of the sentence starting with "Land-related responses ..." It is suggested to include the following reference: M.J. Sanz, J. de Vente, J.-L. Chotte, M. Bernoux, G. Kust, I. Ruiz, M. Almagro, J.-A. Alloza, R. Vallejo, V. Castillo, A. Hebel, and M. Akhtar-Schuster. 2017. Sustainable Land Management contribution to successful land-based climate change adaptation and mitigation. A Report of the Science-Policy Interface. United Nations Convention to Combat Desertification (UNCCD), Bonn, Germany. https://knowledge.uncccd.int/sites/default/files/2018-09/UNCCD_Report_SLM_web_v2.pdf	We left this to Chapter 7	Government of Germany	Federal Ministry for the Environ	Germany
5183	9	38	9	38	Add a sentence stating that the ranking given in SPM-4 varies widely from a country to another. For example, in countries with low GDP, the industry emissions are close to zero.	Thank you, we have added clarification	Michel SIMON	Retraité/ Pdt d'association	France
50527	9	38	9	38	It is unclear to me that updated estimates should be mentioned in this paragraph, which is about the previous assessment reports.	Accepted	Anne Marie Treguier	CNRS	France
12821	9	43	9	43	{AR5 IPCC (Fig.TS.5)}. Write Figure and remove one extra bracket	Accepted	Amanullah Amanullah	Department of Agronomy, Thi	Pakistan
75905	9	43	9	43	Please indicate WGIII	thank you	Jan Fuglested	CICERO	Norway
12823	9	44	9	44	since then (chapter 2). Write Chapter i.e. capital C	Accepted	Amanullah Amanullah	Department of Agronomy, Thi	Pakistan
50633	9	45	10	3	Which of the previous assessment reports does this paragraph refer to? None is cited.	This was linked to next para; now joined	Anne Marie Treguier	CNRS	France
78267	9	45	9	45	Chapter 14 does not only use a "global commons" framing and it might be useful to reflect that	Amended	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
86891	9	45	10	3	Could cite Chapter 8, as well.	Thank you	Meredith Keller	Yale University	United States of America
12825	10	2	10	2	problem (Chapter 13, 14). Write as Chapters not Chapter	Accepted, thanks	Amanullah Amanullah	Department of Agronomy, Thi	Pakistan
65259	10	4	10	9	again, thank you for making these connections with fairness and justice clear, as it leads to more effective and successful policy decisions.	Thank you!	Lindsey Cook	Quaker United Nations Office	Germany
12827	10	9	10	9	and economics." p. 37) Remove page number no need to give page numbers in the text.	Accepted, thanks	Amanullah Amanullah	Department of Agronomy, Thi	Pakistan
50529	10	15	10	21	The last sentence of this paragraph repeats the first one.	Thank you, duplication removed	Anne Marie Treguier	CNRS	France
65981	10	15	10	21	The focus should be on lifestyle changes and not on behavioral change. Chapter 5 is definitely not about the latter	Accepted	Yamina Saheb	OpenExp	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
65979	10	19	10	21	This sentence repeat the one in line 15-16	Thank you, duplication removed	Yamina Saheb	OpenExp	France
4087	10	20	10	20	Correct error: begun began.	This mistake has been removed thank you	Tatsuki Ueda	National Agriculture and Food	Japan
15443	10	20	10	20	"have begun began": Duplicated?	This mistake has been removed thank you	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan
30525	10	20	10	20	Remove "began" from "have begun began"	This mistake has been removed thank you	Government of Japan	Climate Change Division - Mid	Japan
43501	10	20	10	20	Please omit the phrase "began" after "have begun" – It should be used by the past participle form.	This mistake has been removed thank you	sadegh zeyaeen	Head of national center for climate change	Iran
50407	10	20	10	20	Please omit the phrase "began" after "have begun" – It should be used by the past participle form.	This mistake has been removed thank you	Government of Iran	Islamic Republic of Iran Meteorology and Hydrology Organization	Iran
51901	10	20	10	20	"begun began" Correct.	This mistake has been removed thank you	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
4325	10	22	10	22	Add contents from other platform contribution... like IPBES	Mentioned & referenced elsewhere	Alka Bharat	Maulana Azad National Institute of Technology	India
14431	10	23	10	23	The title needs rephrasing. What do you mean by "...and the 2015 agreement"? Do you mean the Paris Agreement? Or do you mean agreements concluded in 2015? There is no reason to do the latter. I would suggest deleting "and the 2015 agreement".	Noted. Paris Agreement is main development discussed.	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
14433	10	23	12	33	This section 1.2.2 does not include several other key developments in the multilateral arena since AR5 that are highly relevant to climate mitigation, notably the CORSIA agreement adopted under ICAO, the IMO strategy, and the Kigali Amendment to the Montreal Protocol. This seems to be a significant gap. Perhaps, at the very least, reference could be made to where these are dealt with in other chapters.	Noted and added cross reference to Ch.14	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
29717	10	23	12	32	Under this sub-section 1.2.2 you should also include the Montreal Protocol for regulation production and consumption of substances that not only deplete ozone but also have significant GWPs. With the Kigali amendment, that was carefully negotiated over several years, and finally adopted in October 2016 the protocol has also more clearly broaden its scope to take on the challenge of regulating substances that do not deplete ozone but have very high GWPs, namely the HFCs. An example of a press release from the ozone secretariate that describes the significance of this Multilateral Environment Agreement can be found here; https://ozone.unep.org/kigali-amendment-implementation-begins . For update on parties ratification of the Kigali amendment; https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtmsg_no=XXVII-2-f&chapter=27&clang=en . Please include "The Kigali Amendment to the Montreal protocol" in a similar manner as the other multilateral processes on page 10 line 24-27. In addition, please include information about the Kigali amendment to the Montreal protocol similarly as currently done in pages 10 to 12 for the Paris Agreement, SDGs, Finance and Talanoa Dialogue and Just transition.	Noted and added cross reference to Ch.14	Government of Norway	Norwegian Environment Agency	Norway
75909	10	23			This is a useful section. You may also include an update on the Montreal Protocol; i.e. the Kigali Amendment.	Noted and added cross reference to Ch.14	Jan Fuglested	CICERO	Norway
51903	10	24	10	27	The list here is inconsistent with what comes next under section 1.2.2 (PA-SDG-Finance-JustTransition)	Noted.	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
14405	10	25	10	27	Rephrase "These include adoption of: the Paris Agreement (no need to add its purpose), the UN Agreements on..., and the UN Sustainable Development Goals (SDGs)". Also, Sendai is not mentioned again in the chapter. Either add in a brief discussion (or perhaps reference to another chapter where it is taken up), or delete here, otherwise the interested reader will be frustrated.	Noted and edited. Inform ch.14 to include Sendai	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
85709	10	25	10	26	Suggest clarification in this passage. The Paris Agreement and the UNFCCC Convention are separate international instruments - while the PA does enhance the convention, its aim is to strengthen the global response to the threat of climate change, including the elements listed in Article 2.1 a-c.	Noted and edited.	Government of Australia	Department of Industry, Science and Energy	Australia
11097	10	28	10	45	A cross reference to Chapter 14 would be useful here, as it contains a full description of the PA.	Noted and edited.	Anthony Patt	ETH Zürich	Switzerland
14407	10	28	10	32	When quoting the PA, it is important to do so precisely, and also to use quotation marks around direct citation. It would make much more sense to invert the first and second sentences, given that this is the order in the PA. So: The Paris Agreement "aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty" by "holding etc..."	Done.	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
15445	10	28	10	28	"The Paris Agreement.": Shouldn't this be written in italic?	Depends on context	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan
22683	10	32	10	34	We recommend to rephrase this sentence in line with article 2.2: "It also provides that the Paris Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances."	Noted but we need to be exact in quoting PA.	Government of France	Ministère de la Transition écologique et solidaire	France
85711	10	33	10	34	Suggest remove or correct. The Paris Agreement does not refer to CBDR-RC as the 'the basis for global action on climate change'. Suggest remove or align with Article 2.2 language, noting implementation will reflect the principle of CBDR-RC-ILDNC.	Noted and edited.	Government of Australia	Department of Industry, Science and Energy	Australia
12829	10	34	10	34	climate change (PA Article 2 paragraph 2). Remove (PA Article 2 paragraph 2).	noted	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
22685	10	36	10	36	Suggestion to delete the word "voluntary" in this line : the fact of submitting an NDC is not voluntary under the PA ("Parties SHALL communicate and maintain NDCs art 4.2")	noted and edited	Government of France	Ministère de la Transition écologique et solidaire	France
70239	10	36	10	36	NDCs are not "voluntary". They are compulsory for every Party to the Paris Agreement must prepare, communicate and maintain successive NDCs, and they must meet certain criteria laid out in Paris Agreement Article 4. The following sentences on the "legally binding process" make this clear.	noted and edited	Philippe Tulkens	European Union (EU) - DG RELEX	Belgium
22687	10	37	10	37	suggestion to replace "obligations" by "emissions reductions targets" because there are legally binding obligations for developed countries (e.g. on finance) in the Paris Agreement as well	noted	Government of France	Ministère de la Transition écologique et solidaire	France
27517	10	40	10	41	USA's decision to withdraw from the PA to be mentioned.	noted, detailed in ch.14.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
85713	10	40	10	40	Suggest updating. As at February 2021, the Paris Agreement has 190 Parties, not 189.	Done.	Government of Australia	Department of Industry, Science and Energy	Australia
85715	10	41	10	45	Recommend updating this passage to reflect the exact text of the Paris Agreement Article 4 paragraph 4. Please edit and put the direct quote from PA in quotation marks as follows: "The PA suggests the roles countries should take in its Article 4, paragraph 4: 'developed country Parties should continue taking the lead by undertaking economy-wide absolute emission reductions. Developing country Parties should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the light of different national circumstances.' "	Done.	Government of Australia	Department of Industry, Science and Energy	Australia

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14409	10	42	10	42	It is important to quote the PA correctly, and include quotation marks in cases of direct citation. Contrary to the text at present, PA Article 4.4 actually states "Developed country Parties should continue taking the lead etc...[the rest is correct]". I am sure that authors will be aware of the significance of should/shall here. The appearance of "shall", rather than "should", in the final draft text of the Paris Agreement - as incorrectly included here - nearly led to the breakdown of the Conference.	Quoted from the final text of Art.4 para 4 PA: Developed country Parties should continue taking ... https://unfccc.int/sites/default/files/english_paris_agreement.pdf	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
22689	10	42	10	42	Suggestion to replace the term "shall" by "should"	Quoted from the final text of Art.4 para 4 PA: Developed country Parties should continue taking ... https://unfccc.int/sites/default/files/english_paris_agreement.pdf	Government of France	Ministère de la Transition écologique	France
14411	11	1	11	1	"The PA acknowledges its mitigation goal implies to...". This is odd and awkward phrasing.	noted	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
54535	11	1	11	3	"The Paris Agreement acknowledges its mitigation goal implies to 'achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century', commonly known as "net zero" (Article 3)." This quote is from Article 4 paragraph 1 of the Paris Agreement, not Article 3. Article 4.1 states: "In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century."	noted and edited	Government of United States of America	U.S. Department of State	United States of America
78269	11	1	11	5	The glossary definition of net zero is more subtle than this. Also check for consistency with Chapter 3 on net zero timing. If these numbers/timeframes have shifted since AR5/SR15 this needs to be explained.	noted and edited	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
81139	11	1	11	9	This para could be much clearer when it refers to 'net-zero' whether it means CO2 or GHG. Paris is about net-zero GHG, but as written now the reader could be led to understand that it is CO2 only. This confusion is enhanced by preceding text often equating net-zero to CO2 only. Please ensure more transparent and consistent use of those terms through this chapter - whenever you say "net zero", be explicit about net-zero CO2 or net-zero GHG, and consider the rationale for choosing one or the other in the given context. Also note that net-zero in Paris is Article 4.1, not Article 3. Further, please insert a cross-reference to WGI Box 1.4 (which discusses climate outcomes from net-zero); plus please consult with and cross-reference Chapter 3 which had intended, and I hope will still do this in its FGD, to include a box on net-zero as well. It would be useful for readers of Chapter 1 to be pointed to those more specific discussions. It would be very useful, if not critical, to make sure that authors from those chapters can review if not co-author this text.	Noted and edited.	Andy Reisinger	Ministry for the Environment	New Zealand
85289	11	1	11	5	This statement on global CO2 emission reductions implied by limiting warming to 1.5°C or likely below 2°C does not seem justified as a key statement of the report. In light of the illustrative pathways (Table SPM1) this seems to be more in line with C3 pathways than those limiting warming to 1.5°C with no or little overshoot (C1). Hence, it's not clear a) why this would limit warming to 1.5°C (except with high overshoot) b) why the IPCC would communicate 1.5°C benchmarks that are very different from those established in the SR15 c) why the IPCC would, in AR6, imply a peaking needed by 2025, when the AR4 already suggested that peaking was needed by 2015 (in 450 ppm scenarios). I suggest to derive this headline message from the C1 category of pathways. That category of pathways seems closest to meeting the Paris Agreement Article 2 definitions of 'holding' warming to 'well below 2°C' and pursuing efforts to limit warming to 1.5°C. Even the C2 category pathways give just a 50 % chance for peak warming 2°C. (Furthermore, regarding peaking by 2025, it is also inconsistent with the statement in TS, page 4, lines 23-25.)	Noted and edited.	Kaisa Kosonen	Greenpeace	Finland
85717	11	1	11	3	Recommend correcting errors in this passage, as follows: "The PA acknowledges its temperature goal implies to 'achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century', commonly known as "net zero" (Article 4). The main goal of the Paris Agreement is referred to as a temperature goal not a mitigation goal. The incorrect article of the Paris Agreement has also been referenced, the correct reference is Article 4 paragraph 1 of the Paris Agreement.	noted.	Government of Australia	Department of Industry, Science and Energy	Australia
75911	11	2	11	9	Please make the difference between net zero CO2 and net zero GHG clear to the reader. As it is now, you start with GHG balance on line 2 and end the para with focus on net zero CO2. See glossary definitions of net zero CO2, net zero GHG, and box in WGI Ch1	noted	Jan Fuglestad	CICERO	Norway
12831	11	3	11	3	known as "net zero" (Article 3). Based. Better to remove (Article 3) no need here.	noted	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
17943	11	3	11	8	Please see our general comment on communication of the findings of scenarios and the way in which net zero and peak dates are described in this report. The text needs to be clear on the relationship between peak dates and net zero dates to avoid giving the impression that there is a combination of late peaking dates and late net zero dates that stay within the carbon budget associated with the temperature goal of the Paris Agreement. This paragraph helpfully explains the dependencies for peak and net zero dates, but could be improved by being explicit about the relationship between the two.	noted	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
51869	11	3			The scenarios assessed in this report are based on the supposition of global CO2 emissions peaking before 2025 and declining to net zero within the third quarter of the century. This entails a political action and beyond the scope of this report. The scenarios assessed should use various assumptions to allow various options for decision makers.	noted	Government of Saudi Arabia	Sustainability Advisor to the Government	Saudi Arabia
70241	11	3	11	4	How certain are the authors that meeting the Paris goals requires global CO2 peaking before 2025? Figure SPM.6 has some 2C scenarios with later peaking. Recognising that this sentence is not the place for a detailed comparison between scenarios, it should not on the other hand make a binary statement like "2C requires peak before 2025" unless this is justified by the overall report's findings.	Text has been revised.	Philippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
22691	11	5	11	5	Suggestion in the sentence "The net-zero CO2...CO2 emissions)" to replace "The net-zero CO2" with "The net-zero CO2 emissions date"	Text has been revised.	Government of France	Ministère de la Transition écologique	France
25067	11	5	11	5	Do you mean net zero year instead of net zero date?	noted	Minal Pathak	WGIII TSU, Ahmedabad University	India

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50531	11	5	11	9	Are these concepts (overshoot, negative emissions) part of the Paris Agreement? Shouldn't they be introduced when presenting the results of the SR1.5, earlier in the chapter?	ntoed	Anne Marie Treguier	CNRS	France
54537	11	8	11	9	Last sentence of paragraph is out of place. Delete or tie it in better.	details in ch.14	Government of United States of America	U.S. Department of State	United States of America
14413	11	10	11	13	The wording in this paragraph, which attempts to summarize PA Article 14, is loose and does not accurately reflect carefully negotiated text.	noted	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
15197	11	10	11	12	This is an inaccurate statement. According to the original text of the Paris Agreement, it is suggested to change "its purposes" into "the purpose of this Agreement".	Noted and edited.	Government of China	China Meteorological Administration	China
85719	11	12	11	12	Suggest remove reference to Article 10; only Article 14 provides the basis for the Global Stocktake.	quoted from Art.4 Para 1 PA: In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking ...	Government of Australia	Department of Industry, Science and Energy	Australia
85721	11	12	11	13	Suggest correction: When referencing Paris Agreement, please keep the text in line with the Agreement. "The outcome of these stocktakes are meant to inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the Paris Agreement (PA Article 14 para 3)."	Noted and edited.	Government of Australia	Department of Industry, Science and Energy	Australia
12833	11	13	11	13	(PA Article 14 para 3). No need to cite it. Especially remove para 3.	Noted and edited.	Amanullah Amanullah	Department of Agronomy, The University of Agriculture	Pakistan
14415	11	14	11	14	The principle is "common but differentiated responsibilities and respective capabilities".	Noted and edited.	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
64901	11	14	11	25	This paragraph lacks mentioning the moral grounds for assistance of Global North in climate mitigation in Global South. Also, when introducing Climate Fund and 100 billion goal - it is necessary to put it in perspective of 'developing countries' debt. Please consider example from Fenton et al study (2014) of Bangladesh – one of the poorest countries and at risk of going underwater due to rising sea levels - pays back over US\$3 for every US\$1 it receives in climate finance to service long-term bilateral debt [https://www.nature.com/articles/ndclimate2303]	Noted and edited.	Marta Baltrusiewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
70243	11	14	11	14	the Paris NDC principles are "common but differentiated responsibilities" and "respective capacities" both "in the light of national circumstances". Quite long, but each one carefully chosen.	noted.	Philippe Tulkens	European Union (EU) - DG RESEARCH AND INNOVATION	Belgium
79897	11	14	25	11	Interesting to stress the diversification of the GCF fund including by its priority shift to adaptation and regional approaches.	noted.	Carlos Ruiz Garvia	UNFCCC	Panama
85723	11	14	11	16	Suggest correcting: Article 9 does not refer to CBD. Delete first part of sentence. Amend to start paragraph with: 'Article 9 of the Paris Agreement states that developed countries shall provide financial resources to assist developing country parties with respect to both mitigation and adaptation in continuation of their obligations under the convention. Other parties are encouraged to provide or continue to provide such support voluntarily' - this is a more accurate reflection of what is stated under Article 9.	noted. Detailed in the finance discussion	Government of Australia	Department of Industry, Science and Energy	Australia
14417	11	15	11	16	Yes, but this was already established in the UNFCCC in 1992. It is not new to the PA	noted.	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
14419	11	18	11	19	Was it really that "rapid"? Also, it would surely be infinitely better to cite the latest statistics from the GCF, not secondary literature, which will be outdated.	noted.	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
17945	11	18	11	18	"climate change" should read "global temperature"	noted	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
72609	11	19	11	24	This section mentions the TCFD as the main governance initiative. This needs to be updated by mentioning two other major governance initiatives: i) at the global level, the creation of the Central Banks and Financial Regulators' Network for Greening the Financial System that provided investors scenarios and guidelines for climate risk assessment (NGFS Climate Scenarios Technical Documentation 2020: https://www.ngfs.net/sites/default/files/ngfs_climate_scenario_technical_documentation_final.pdf); ii) the EU Taxonomy of sustainable investments, which provided the first standardized and actionable classification of sustainable activities, and that has already been assessed in the financial market (Alessi et al 2019: Alessi, L., Battiston, S., Melo, A., & Roncoroni, A. (2019). The EU Sustainability Taxonomy: a Financial Impact Assessment. European Commission, available at: https://ec.europa.eu/jrc/en/publication/eusustainability-taxonomy-financial-impact-assessment.)	noted and edited.	Irene Monasterolo	Vienna University of Economics and Business	Austria
22693	11	20	11	20	Suggestion to delete the statement : " although still short of the goal to mobilised USD100 billion by 2020." the GCF is not meant to be the only recipient for the \$100b that needs to be provided by developed countries (also development banks etc.)	Corrected	Government of France	Ministère de la Transition écologique	France
51905	11	20	11	20	mobilised should be mobilise	noted	Government of Saudi Arabia	Sustainability Advisor to the Government	Saudi Arabia
14421	11	21	11	21	NAZCA was not just for city-based actions. And it has now been renamed Global Climate Action	Done.	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
27519	11	21	11	25	Delete "Initiatives contributing to the PA goals include the Non-State Actor Zone for Climate Action (NAZCA) portal, launched at COP20 (Dec 2014) in Lima, Peru, to support city-based actions for mitigating climate change (Mead 2015) and Galvanizing the Groundswell of Climate Actions (GGCA) which is a UNFCCC-backed series of open dialogues intended to bring climate actions from cities, regions, companies, and other groups to a higher level of scale and ambition.", as these initiatives are not related to finance issues on which this paragraph focuses.	Done.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
79957	11	21	11	25	The Race to Zero Dialogues spearheaded by the High Level Champions of the Marrakech Partnership (Gonzalo Munoz and Nigel Topping) have emerged as dominant campaigns for non state actors to contribute to the goals of the Paris Agreement, since 2020 - and these campaigns are formulating what are called "breakthroughs" (measurable commitments/targets) against which non state parties are expected to voluntarily report progress.	noted	Mairi Dupar	Overseas Development Institute	United Kingdom (of Great Britain and Northern Ireland)
12835	11	22	11	22	(Dec 2014) Write December	noted	Amanullah Amanullah	Department of Agronomy, The University of Agriculture	Pakistan

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14423	11	23	11	25	I'm not clear why GGCA is highlighted here, when so many others could be mentioned (eg Race to Zero in the run-up to COP 26). The purpose of the group, as stated here (with wording taken directly from its home page) seems very generic.	Done.	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
22695	11	23	11	25	The reference to GGCA seems to be mistaken as it is not backed by the UNFCCC. Please consider refer to the Marrakech Partnership for Global Climate Action instead, that supports implementation of the Paris Agreement by enabling collaboration between governments and the cities, regions, businesses and investors that must act on climate change	Done.	Government of France	Ministère de la Transition écologique	France
72963	11	23	11	24	The reference to transparency is not standard in the academic and practitioners' literature, which instead refers to "disclosure of climate-related financial risks". The TCFD (2017) refers to disclosure, while main academic and policy citations for the importance of disclosure for risk assessment are: i) Battiston et al. (2017), which introduced the importance of standardized disclosure for climate financial risk assessment, and proposed a methodology for disclosure (Climate Policy Relevant Sectors, that has been applied by several central banks and financial institutions, see Ch. 15: Battiston, S., Mandel, A., Monasterolo, I., Schütze, F., & Visentin, G. (2017). A climate stress-test of the financial system. Nature Climate Change, 7(4), 283-288); ii) NGFS (2019): A call for action. Climate change as a source of financial risk (https://www.ngfs.net/sites/default/files/medias/documents/synthese_ngfs-2019_-_17042019_0.pdf) has discussed the importance of disclosure as a precondition for climate financial risk assessment with substantial, science-based grounding in climate finance. For sake of clarity and coherence with the standard literature and narrative, you may want to consider replacing "Ameli et al (2019)" with the above suggestions.	Done.	Irene Monasterolo	Vienna University of Economics and Business	Austria
84507	11	23	11	25	The UNFCCC Race to Zero can be considered within the relevant statement as a more recent development.	Reject;d, not really appropriate IPCC material	Sir KILKIS	The Scientific and Technological Research Council of Turkey	Turkey
15447	11	28	11	28	"...and the planet While ...": A period should be placed after 'planet'.	noted	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan
51907	11	28	11	28	missing dot before While	Thank you	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
63201	11	28	11	28	Edit: targets to support people, peace, prosperity, partnerships and the planet	Thank you	Government of Canada	Environment and Climate Change Canada	Canada
74067	11	28	11	28	full stop before "While"	Thank you	Beate Antonich	Center for Climate Change and Energy Policy	United States of America
22697	11	30	11	31	In the sentence "While climate change...(Biermann et al. 2017)." we recommend to add the SDG 12 Responsible consumption and production	Accepted	Government of France	Ministère de la Transition écologique	France
6865	11	31	11	38	Please check here for repetition	Thank you	Debra Roberts	EThekweni Municipality	South Africa
8949	11	31	11	38	This narrative again gives for granted the idea of development. "Synergies and trade-offs across the SDGs" hide the systemic need for holistic integrated analyses, that are incompatible with the fragmentation of the presented approach.	But synergy implies a more holistic approach	Francesco Gonella	Ca' Foscari University of Venice	Italy
31719	11	31	11	31	"life on land (14) and water (15)"- SDG 14 is Life below water and SDG 15 is Life on Land. Please rectify	Thank you	Shreya Some	Ahmedabad University	India
45723	11	31	11	31	The SDG on "Life on Land" is SDG 15 (not SDG 14, which is Life below water). The SDG on "water" would be SDG 6 (Access to and availability and sustainable management of water and sanitation) or SDG 14.	Thank you	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
70245	11	31	11	31	Correction needed from 'as well as those relating to life on land (14) and water (15)' to 'as well as those relating to life on land (15) and water (14)'	Thank you	Philippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
22699	11	34	11	35	The sentence "This suggests that mitigation must be pursued in the broader context of sustainable development." is repeated on page 11 line 37 to page 11 line 38. We suggest to remove one of them.	Thank you	Government of France	Ministère de la Transition écologique	France
54539	11	34	11	38	Last two sentences of this paragraph duplicates text in the previous two.	Thank you	Government of United States of America	U.S. Department of State	United States of America
72383	11	34	11	35	Delete double sentence (line 34 = 36): "This suggests that mitigation must be pursued in the broader context of sustainable development."	Thank you	Paul Maidowski	Fletcher School, Tufts; independent	Germany
14425	11	35	11	36	Sentence duplicated in lines 31-32	Thank you	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
72379	11	37	11	38	Would it not clarify the tradeoff to delete this sentence and add the following? Add: "The tradeoffs between biophysical and socioeconomic SDGs suggest that extraordinary efforts would be needed to achieve all SDGs within planetary boundaries. Further study is necessary to achieve a fully causally endogenous global model system, to assess the consequences of sustainable global policy on the evolution of the 17 SDGs and the safety margin to planetary constraints. This suggests that mitigation must be pursued in the context of sustainable development. Sustainable development in turn depends on the feasibility and consequences of transformational change and the respect of planetary boundaries (Randers et al. 2019)."	Too long and complex, rejected	Paul Maidowski	Fletcher School, Tufts; independent	Germany
72381	11	37	11	38	Add reference: Randers, Jørgen et al. 2019. "Achieving the 17 Sustainable Development Goals within 9 Planetary Boundaries." Global Sustainability 2.	As above	Paul Maidowski	Fletcher School, Tufts; independent	Germany
74069	11	37	11	38	Sentence repeated from line 34: delete " This suggests that mitigation must be pursued in the broader context of sustainable development"	Thank you	Beate Antonich	Center for Climate Change and Energy Policy	United States of America
49783	11	39	12	24	Recent actions in the insurance industry, pension funds and banking to move investment into the low carbon sector is a significant development that should be included in this section on finance. The movement to the low carbon sector has almost entirely been occurring thanks to campaigns led by climate activists and Indigenous Peoples. Also important to note: insurance companies are realizing actual costs of climate impacts and pivoting in response to this as well.	In section 1.4	Chloe Hartley	Tsleii-Waututh Nation	Canada
74071	11	40	11	40	delete dot "." so it reads "development" (PA Article 2.1.c.)"	Thank you	Beate Antonich	Center for Climate Change and Energy Policy	United States of America
74073	11	41	11	41	specify the verb "reflects" by adding "with greater clarity" so it reads: "reflects with greater clarity a broadened focus" The reason for this addition is that, from a legal perspective, parties agreed to be more specific and explicit in the important "objective" provision of the new legal instrument under the UNFCCC.	Think this too fine a point for intro	Beate Antonich	Center for Climate Change and Energy Policy	United States of America
25065	11	42	11	42	WGII includes 'low carbon' within the definition of CRDPs. This will be revised. To incorporate revised version	Updated info from TSU incorporated, thanks	Minal Pathak	WGIII TSU, Ahmedabad University	India
8209	11		12		In regards to "Finance", I would suggest to also mention the EU Taxonomy - a first step to defining what is considered as green and what we should invest in.	Section 1.4 discusses finance	Frida Zahlander	DanChurchAid	Denmark

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27521	12	1	12	7	The estimates on finance should be updated to also consider the economic environment as a result of COVID-19.	This is well covered in the COVID box	Eleni Kaditi	Organization of the Petroleum	Austria
51909	12	1	12	1	require should be requires	Thank you	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
74075	12	9	12	11	ensure consistency in the use of " or "	Thank you	Beate Antonich	Center for Climate Change, E	United States of America
6867	12	14	12	14	It will be helpful if you specify the magnitude of the increase.	Has chapter ref to the detail	Debra Roberts	EThekweni Municipality	South Africa
25069	12	15	12	15	Paris Agreement goals?	amended	Minal Pathak	WGIII TSU, Ahmedabad Unive	India
19079	12	19	12	24	This section should not downplay the role of transparency. Assume growing societal force in favour of climate action. Then transparency of the financial system should see us realise the climate goals. Why? The state will align to society. And transparency of the financial system means alignment of the market to the goals. So, emphasize transparency.	Final sentence removed, issue discussed later	Fred Amonya	Lyclair	United Kingdom (of Great Britain and Northern Ireland)
80353	12	19	12	21	The statement is not up to date. A reference should be made to the NGFS in particular the 2019 report NGFS. (2019). NGFS - A call for action Climate change as a source of financial risk. Retrieved from https://www.ngfs.net/en/first-comprehensive-report-call-action	In the finance section 1.4.3 we cite NGFS2020	Stefano Battiston	University of Zurich	Switzerland
66821	12	22	12	33	Building services may separately classify the following 4 items: shelter, nutrition, sanitation, thermal comfort from entertainment, communications and illumination. The first 4 items may be given priority in building design as such are people's basic needs for survival and wellbeing.	Too much detail for this brief intro	Maria Luisa Garcia	Green Architecture Advocacy	Philippines
74749	12	22		23	"Although this reflects concern about the risks posed by climate change to the stability of the global financial system (and vice-versa)". I suggest to add the citation of Battiston et al. (2017) that has been the first and highly referenced academic work examining the relation between climate risks and financial stability (Battiston, S., Mandel, A., Monasterolo, I., Schütze, F., & Visentin, G. (2017). A climate stress-test of the financial system. Nature Climate Change, 7(4), 283-288.).	Accepted (for 1.4.3)	Irene Monasterolo	Vienna University of Econom	Austria
80355	12	22	12	25	The impact of climate change (transition risk) on global financial stability has been examined in Battiston, S., Mandel, A., Monasterolo, I., Schütze, F., & Visentin, G. (2017). A climate stress-test of the financial system. Nature Clim. Change, 7(4), 283-288. Retrieved from http://dx.doi.org/10.1038/nclimate3255	Accepted (for 1.4.3)	Stefano Battiston	University of Zurich	Switzerland
12837	12	24	12	24	(Ameli et al. 2019) (15.6.3). Remove (15.6.3).	More detail there	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
14427	12	25	12	26	This mention of the Talanoa Dialogue is excessively brief, giving no indication of the importance and origins of the "facilitative dialogue", which was in fact mandated by decision 1/CP.21, para 20, and was therefore part of the "package" adopted in Paris. I cannot find the document referred to as UNFCCC (2018a) on the UNFCCC website. A websearch reveals what is probably the document, https://www.actu-environnement.com/media/pdf/news-32459-rapport.pdf , but from a news site, which raises questions as to its authenticity and rigour. I also cannot find mention of holistic approaches in that document. The reference to Mead 2018 is simply to an IISD report, and is therefore not a suitable reference, nor does it support the statement it is associated with.	Thank you for your comment. Due to strict word limits, we were unable to expand on this. We have, however, removed these two references.	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
25071	12	27	12	27	Delete 'also'?	Thank you	Minal Pathak	WGIII TSU, Ahmedabad Unive	India
14429	12	31	12	31	I am familiar with the cited paper, and believe that this reference should read "...risks for countries and communities that rely...".	Edited, thank you	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
4327	12	33	12	33	Add heads of Ecosystem services , Biodiversity and refer to the documents of IPBES and other related platforms	Thank you for your comment. We have added the following text to this section: "and for maintaining ecosystem integrity through nature-based solutions". Due to word constraints, we were not able to expand on ecosystem services, however this is mentioned in the "Sectors and Services" section	Alka Bharat	Maulana Azad National Instit	India
22701	12	34	12	34	In this section we suggest to better specify here what comes under the sustainable anthropocene (with the 3 pillars of sustainable development) which seems more and more difficult or improbable with the notion of liveable anthropocene (for the future of humanity)	The section is necessarily compressed and the report is focused on mitigation, so didn't expand on this	Government of France	Ministère de la Transition éco	France
75913	12	34			Very good that you link to the other WGI as you do in section 1.3.1. I suggest you strengthen this by involving authors from WGI and WGII as Contributing Authors here. Please also update according to FGD from WGI.	Noted. Note this is now Section 1.2.2.	Jan Fuglestedt	CICERO	Norway
14435	12	35	12	35	Why since 2015? My understanding is that AR6 should focus on the period since AR5	Accepted. We removed the mentions of 2015. Note this is now Section 1.2.2.	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
4329	12	39	13	46	Add reference : Bharat A (2006) ,Downscaling Climate Change Mitigation Tools in Local Government- From UNFCCC Goals to India , IDGEC Synthesis Conference Bali, Indonesia , http://www2.bren.ucsb.edu	Not appropriate ref for short intro sections: also this report mainly assessing literature published after AR5 (since c. 2013)	Alka Bharat	Maulana Azad National Instit	India
4331	12	39	13	46	Add Reference : Bharat A, Sharma D (2007) "Climate Change and Cities: what it means to us and how India addresses the issue " , - Spacio Economic Development Record (SDR), Vol. 14, No. 4 July - Aug.07, Page no. 5 – 13, ISSN 0971 - 4944	Not appropriate ref for short intro sections: also this report mainly assessing literature published after AR5 (since c. 2013)	Alka Bharat	Maulana Azad National Instit	India
4333	12	39	13	46	Add Reference: Sharma D, Bharat A (2009). Conceptualising Risk assessment framework for impacts of Climate change on water resources, current science Vol. 96, no. 8, 25 April 2009, pp. 1044 – 1052, ISSN 0011-3891	Not appropriate ref for short intro sections: also this report mainly assessing literature published after AR5 (since c. 2013)	Alka Bharat	Maulana Azad National Instit	India
4335	12	39	13	46	Add reference : Nair Rekha S, Bharat A (2011) , Nair Rekha S, Bharat A (2011) , Methodological frameworks for Assessing vulnerability to climate change; Journal of the Institute of Town planners India, Vol. 8 no. 1, Jan. – Mar., Page no. 1 – 15, ISSN 0537 – 9679	Not appropriate ref for short intro sections: also this report mainly assessing literature published after AR5 (since c. 2013)	Alka Bharat	Maulana Azad National Instit	India
4337	12	39	13	46	Add reference : Nair Rekha S ,Bharat A, Manu G. Nair (2013). Impact of climate change on water availability: Case study of a small coastal town in India. Journal of water and climate change (by IWA Publishing), Vol. 4 , No. 2 , 2013 , pp 146 – 159, ISSN: 2040-2244	This is far too specific for a general and compressed intro, sorry - and its about mitigation not impacts	Alka Bharat	Maulana Azad National Instit	India
4339	12	39	13	46	Add reference : Nair Rekha S ,Bharat A, Manu G. Nair (2012). Framework for Integrating adaptation policies for climate change in development plan, International Journal of Environmental Engineering and Management, Vol. 3 , No. 3 ,2012 , pp 235-249, ISSN 2231-1319	Not appropriate ref for short intro sections: also this report mainly assessing literature published after AR5 (since c. 2013)	Alka Bharat	Maulana Azad National Instit	India

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
66181	12	39	12	45	With regard to the rate of sea level rise, sea-level has been rising since the last ice age (more rapidly between 9000 and 7000 BP and more slowly since then). One must factor in historical rising levels, of the order of 12 to 16 mm/decade (van de Plassche, 1986; Jelgersma, 1979; Denys & Baeteman, 1995; Beets & Van der Spek, 2000; Zeeberg, 2009) and not ascribe all sea level changes to anthropogenic GHGs. There is a need to allow open discussion of scientific data. References: Beets, DJ & van der Spek, AJF (2000) The Holocene evolution of the barrier and the back-barrier basins of Belgium and the Netherlands as a function of late Weichselian morphology, relative sea-level rise and sediment supply. <i>Geologie en Mijnbouw / Netherlands Journal of Geosciences</i> 79 (1): 3-16 (2000) Denys, L., & Baeteman, C. (1995). Holocene evolution of relative sea level and local mean high water spring tides in Belgium—a first assessment. <i>Marine Geology</i> , 124(1-4), 1-19. Jelgersma, S. (1979). Sea-level changes in the North Sea basin. In: E. Oele et al. (eds.): <i>The Quaternary history of the North Sea</i> , Acta Univ. Ups. Symp. Univ. Ups. Annum Quingentesimo Celebrantis 2, 233–248. van de Plassche, O. (1986). <i>Sea-Level Research: A Manual for the Collection and Evaluation of Data</i> . Edited by Orson van de Plassche. Geo Books, Norwich, UK. Zeeberg, J. (2009) <i>Flood control in the Netherlands - A strategy for dike reinforcement and climate adaptation</i> . Hoogheemraadschap van Rijnland, Leiden, the Netherlands. ISBN 978-90-72381-10-1	This sounds like a comment to the Science report, not Mitigation	Donal OCallaghan	Teagasc (retired member)	Ireland
12839	12	42	12	42	in at least the last 2 million years. Give reference for this.	Noted. The reference for this is the WG1 AR6 report as clearly stated in the beginning of this very sentence: "The assessment of the Physical Science Basis (IPCC WGI AR6) ...". Note this is now Section 1.2.2.	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
12663	13	3	13	3	An important paper on climate controls on future wildfire area burned is: Kitzberger T, DA Falk, AL Westerling, and TW Swetnam. 2017. Direct and indirect climate controls predict heterogeneous early-mid 21st century wildfire burned area across western and boreal North America. <i>PLoS One</i> 12(12): e0188486. https://doi.org/10.1371/journal.pone.0188486	This report is about emissions mitigation	Donald Falk	University of Arizona	United States of America
77995	13	3	13	4	Suggested Edit I suggest inserting the following paragraph between lines 3 and 4: "The IPCC 2019 SROCC documents the rapid melting of Arctic summer sea ice. Current data suggests that, in the absence of proactive "triage" efforts to prevent this, the first "blue ocean event", or, the beginning of a complete melting of the Arctic summer sea ice – the first climate "tipping point" (Lenton et al. 2009), could occur as soon as 2025 (POMAS 2021). Multiple studies suggest that crossing this first tipping point will cause abrupt acceleration of global warming and "Arctic amplification" with increased adverse global climate impact and risk of crossing additional climate tipping points, and that climate triage methods may be able to temporarily prevent crossing this tipping point until sufficient GHGs have been drawdown to permanently prevent it from occurring, see references in (Baiman+18 2021,2020). Climate triage efforts are urgently necessary now per the PA Article 8 international recognition of the "... importance of averting, minimizing, and addressing loss and damage from the adverse effects of climate change...". Rationale: As stated in the edit. References: Baiman, Ron. 2021. The Climate Crisis and a Renewable Energy and Materials Economy (REME): A Global Green New Deal (GGND) that Includes Arctic Sea-Ice Climate Triage and Carbon Cycle Climate Restoration. Presentation to American Economic Association/Allied Social Sciences (AEA/ASSA) annual meeting. Submitted to the Review of Radical Political Economics. Accessed at: https://www.cpeonline.org/post/arctic-sea-ice-triage-carbon-cycle-restoration-and-a-renewable-energy-and-materials-economy Baiman, Ron. 2020. Financial Bailout Spending Would Have Almost Paid for Thirty Years of Global Green New Deal Climate: Triage, Regeneration, and Mitigation. <i>Review of Radical Political Economics</i> 52(4): 650-661. https://doi.org/10.1177/048663420945606 Lenton et al. 2008. Tipping elements in the earth's climate system. <i>PNAS</i> 102(6) Feb. 12. Pistone, Kristina, Ian Eisenman and Veerabhadran Ramanathan. 2019. Radiative heating of an ice-free Arctic ocean. <i>Geophysical Research Letters</i> . Jul 10. POMAS. 2021. Plot of Polar Science Center Ice Volume Data 1979 – present. Accessed at: https://1adebb0b-9-63b3a3a-9-sites.googleusercontent.com/site/arcticschegpagan/home/pomas-trnd1.png?attachauth=ANoY7c74y3E5qUngTbaCg72Zp2eBevGSeW-XS4tGTMT6c4ZeiPKA1TRJHeiJYD0XK117Rk9W5G8RXC1MROZ0YPEL_V51X3d0MY8B8iJkcyT7-MCmZ6yJ805F_QiVg6PD628Gm0bdNo1EhF90ID0ph4B84hXQmH5cflqbaFNbZ1K8tbMhrFrE1AmNNVAVL99kYpALNZP2yXKZG4TW9gRjVJG1JMM1LDhNeUauZPwV3yrvYGmaw6Y0YW&attredirects=0	We have underlined urgency, but this comments seems mostly about science covered in the WG1 and II reports	Ron Baiman	Benedictine University	United States of America
8951	13	4	13	42	About risks, it is not clear what risks we are talking about, and whom and what are the subjects threatened by these risks. Some clear statements should be made about that.	Noted	Francesco Gonella	Ca' Foscari University of Veni	Italy
50533	13	4	13	5	is it possible to use the stronger wording of AR6, rather than the wording of AR4?	Rejected. Actually, this reference to AR4 is only in relation to how "the IPCC has sought to systematise a robust approach to risk and risk management" as stated at the end of the sentence. This is a process that began with AR4 and predates the AR6 Wg1 report. Note this is now Section 1.2.2.	Anne Marie Treguier	CNRS	France
12841	13	12	13	12	interference' (Footnote 1), no need to cite Footnote inside the text	Accepted. Added reference to the UNFCCC convention. Note this is now Section 1.2.2.	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
70247	13	14	13	23	When mentioning climate risk there needs to be a brief description of what it is as many reading this report will not be familiar with basic concepts: exposure and vulnerability to climate hazards	Noted	Phillippe Tulkens	European Union (EU) - DG Re	Belgium
50535	13	15	13	15	Cross chapter box 1.3 of WGI could also be cited here.	Accepted. Note this is now Section 1.2.2.	Anne Marie Treguier	CNRS	France
25073	13	17	13	18	Suggest 'risks can arise from potential impacts of climate change as well as human responses to climate change. Delete 'risks' at the end. Please refer to the revised Risk guidance: 'Reisinger, Andy, Mark Howden, Carolina Vera, et al. (2020) The Concept of Risk in the IPCC Sixth Assessment Report: A Summary of Cross-Working Group Discussions. Intergovernmental Panel on Climate Change, Geneva, Switzerland. pp15	Accepted. Note this is now Section 1.2.2.	Minal Pathak	WGIII TSU, Ahmedabad Unive	India
7905	13	20	13	21	"for choosing appropriate allocations of effort and resources among various approaches for reducing and equitable sharing of risks;" "does it mean: "";	Thanks, abbreviated	Caroline ROELANDT	Federal Agency for Nuclear C	Belgium
50537	13	26	13	26	The concept of "deep uncertainty" could be introduced in this chapter. It is discussed in AR6 WGI, chapter 1, for the physical system context.	is already mentioned	Anne Marie Treguier	CNRS	France
80515	13	28	13	30	Replace L28-30 by: The expression climate resilient has become very popular during the last decade, while the paradigm shift that it represents with respect to the classical risk management framework may somewhat remain underestimated. More precisely, social–ecological resilience is a theoretical framework that allows to comprehend the complex interactions among social, economic, physical and environmental components of complex systems like urban systems and to measure their multiscale capacity to absorb disturbances, reorganise and retain most the same functionalities (Vicari et al. 2019a and references herein). The question of resilience metrics has become more and more important, in particular with the help of text mining techniques (Vicari et al. 2019b)	Noted	Daniel Schertzer	Hydrology Meteorology and	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
22703	13	37	13	37	The subsection "Economic benefits of avoiding climate change impacts" in chapter 3 is the 3.6.2. Section 3.6.1 is "Economy-wide implications of mitigation" So we recommend to replace 3.6.1 with 3.6.2 in "(Sections 1.6.2 and 3.6.1)"	Thank you, Corrected this issue	Government of France	Ministère de la Transition éc	France
20045	13	38	13	39	See: -van Vliet, O., Hanger-Kopp, S., Nikas, A., Spijker, E., Carlsen, H., Doukas, H., & Lieu, J. (2020). The importance of stakeholders in scoping risk assessments—Lessons from low-carbon transitions. Environmental Innovation and Societal Transitions, 35, 400-413.	Noted; Doukas already cited on decision-support - not really sure of the core point here	Haris Doukas	National Technical University	Greece
20133	13	38	13	46	Reference underpinning this: van Vliet, O., Hanger-Kopp, S., Nikas, A., Spijker, E., Carlsen, H., Doukas, H., & Lieu, J. (2020). The importance of stakeholders in scoping risk assessments—Lessons from low-carbon transitions. Environmental Innovation and Societal Transitions, 35, 400-413.	Repeated	Nikas Alexandros	National Technical University	Greece
12843	13	39	13	39	WGII Chap 16. Write Chapter not Chap	Accepted. Note this is now Section 1.2.2.	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
4341	14	1	14	1	Add 1.3.2 as Resilience efforts .. Dovetail the work and contribution of UNDRR , ICLEI AND OTHER Organisations and Platforms	With apologies this comment got 'misallocated', most relevant to our 1.3.1, there are some references elsewhere in the report (eg. Chapter 4) perhaps we could have flagged these more in Chapter 1 but constrained for space	Alka Bharat	Maulana Azad National Instit	India
7807	14	1	16	21	An important Figure 1.7 in AR5/WG3/Chapter 1 (p. 129) is missing here. This figure explains the reasons of changes in emissions and useful information for policymakers. Please insert the same type of figure here.	Figures have been revised in discussion with CLAs and LAS	Mitsutsune Yamaguchi	Research Institute for the Int	Japan
79899	14	1	14	15	Figure 3. Suggest to enable data comparison with AR5.	Figures have been revised in discussion with CLAs and LAS	Carlos Ruiz Garvia	UNFCCC	Panama
86879	14	1	16	21	Section 1.3.2 (and/or 1.3.5) could reference Ch. 8's urban emission wedge figures that indicate that urban areas account for a growing and significant proportion of global emissions in RCP/SSP scenarios - even approaching 100% of total global emissions in some SSPs; see Figures 8.10 and 8.14.	Noted	Meredith Keller	Yale University	United States of America
45399	14	2	14	11	As the footnote to Figure 1.2 states, it is crucial to update the Figure with latest data for the final draft	Noted	Elena Verdolini	University of Brescia and Eur	Italy
51911	14	2	14	4	This is inconsistent with the estimate cited in the TS (3-14 , L10-11) "The average rate of emission growth was 1.3% per year between 2010 and 2018, compared to 2.3% per year in the previous decade". Here it says 1.4%/2.5% and earlier it says 1.3%/2.3%. Needs to be corrected.	Thank you. We have corrected	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
85725	14	2	14	4	The authors provide the population growth rate for the period 2010 - 2018. Can the authors also provide the population growth rate for the period 2000 - 2010 for comparison?	Don't think it necessary	Government of Australia	Department of Industry, Scie	Australia
14437	14	3	14	3	The figures 1.4% and 2.5% are slightly different to those given in section B.1.1 of the SPM	Thank you, we have corrected	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
12845	14	4	14	4	growth (c.1.1% yr-1). What is c. 1	Thank you, we have clarified	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
12847	14	7	14	7	(by 1.5% and 1.7% respectively). Always better to write comma before respectively	Thank you	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
82523	14	7	14	11	IEA has recently published the global energy review on CO2 emissions. It will be useful to check the latest data. https://www.iea.org/articles/global-energy-review-co2-emissions-in-2020	Done	Jinsun Lim	International Energy Agency	France
50539	14	10	14	10	A forward reference to the box on COVID19 would be useful here.	Noted	Anne Marie Treguier	CNRS	France
12849	14	11	14	11	2020 (IEA 2020a); (Chapter 2). No need to write Chapter 2 here reference is already given.	Done	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
25075	14	11	14	11	Duplicates with Figure 2.4 in Chapter 2. Do you want to drop the figure and refer to chapter 2?	Noted. But better to stay here	Minal Pathak	WGIII TSU, Ahmedabad Unive	India
27529	14	11	14	11	Here an 8% reduction is presented and on page 17 a 7% reduction is mentioned. Allow consistency please.	Latest data is 5.8%	Eleni Kaditi	Organization of the Petroleu	Austria
8049	14	12	14	17	Figure 1.2: Please explain where Agriculture is represented in this graph. Is it divided and included in "FFI", CH4 and N2O, or is just the "A" missing from "AFOLU"?	Corrected	Joachim Rock	Thuenen-Institute of Forest E	Germany
72415	14	12	14	12	Title: add "and percentage of relative contribution"	Figure has been restructured and revised	Sylvain Pichat	University of Lyon, Ecole nor	Germany
72417	14	12	14	12	All the percentage are not at 100%. While I do understand why (rounding and Fgas %tage not shown for 1990 and 2000), it is something that climate change deniers could pick up	Noted	Sylvain Pichat	University of Lyon, Ecole nor	Germany
84139	14	12	14	12	Figure 1.2 The percentages here are not useful as they only apply to a very specific metric, they don't account for the uncertainty in that metric ~ 30% and don't account for the uncertainty in using different metrics. The contribution from methane would only be 5% using GTP100 or would be ~ 50% using GWP20.	Rejected. Similar figure was already included in AR5 (Figure 1.8)	William Collins	University of Reading	United Kingdom (of Great Britain and Northern Ireland)
43523	14	13	14	13	How about adding examples of hydro-meteorological disasters related to climate change occurs in several countries and making analysis of correlation between the increment of those disasters and the increment of GHGs? For example, normally in Indonesia there are 2 seasons i.e. dry season and rainy season. In recent years, hail storm occurred in Indonesia. It is interesting to know why hail storms occurred in tropical country like Indonesia. Right now we can classify it as extreme events. However, most likely abnormal will be a new normal in the near future. Hence, if possible there is study to correlate extreme events with increment of GHGs.	Rejected. Not relevant to this paragraph	INTAN SUPRABA	Universitas Gadjah Mada	Indonesia
2973	14	18	14	18	Should read 'Figure 1.3 shows...'	Done	Beth Edmondson	Federation University	Australia
11403	14	18	15	4	Re: "east Asia now forms substantially the biggest group" and the upper panel of Figure 1.3. The text and the figure tend to convey the message that East Asian countries now have a greater share of responsibility for causing climate change. However, one should note that climate change is the result of long-term cumulative release of greenhouse gases (GHG) into the atmosphere instead of GHG emissions in a single year or a decade or so. The upper panel of Figure 1.3 shows only a snapshot of the long history of GHG emissions. According to Global Carbon Budget 2020 (https://www.globalcarbonproject.org/carbonbudget/20/files/GCP_CarbonBudget_2020.pdf , P.88), the cumulative GHG emissions during 1850-2019 by Asia is still below those emissions by Europe and North America. Without a proper historical perspective, the general public would be mis-led. Suggest removing the figure in concern.	Rejected. Similar figure was already included in AR5 (Figure 1.8)	SAI MING LEE	Hong Kong Observatory	China
54541	14	18	14	18	Define GDPppp acronym.	Done	Government of United States of America	U.S. Department of State	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
7805	14		14		In Figure 1.2, global GHG emissions in 2010 was shown as 52Gt, whereas it was 49Gt CO2eq in AR5/WG3/Chapter 1. It seems that the difference was caused by the difference of GWPs between AR5 and AR6. However, for policymakers or negotiators on climate change, 49Gt in 2010 was the figure they used in any occasion. It might be better to explain what are GWPs and explain briefly why the figures were altered by inserting a box. In Committee on Climate Change's advice to the UK Government on 6th carbon budget, CCC explained the reason of increase of UK emission figures due to the change of GWP in IPCC 6th Assessment Report. Also the GHG emissions in 2100 is 53Gt in AR6/WG3/SPM. Please check.	It is explained in Chapter 2.2.2.1	Mitsutsune Yamaguchi	Research Institute for the Inn	Japan
9829	14				Fig. 1.2 The figure is in a very low pixel quality. It should be changed with a clearer figure.	Figure with higher resolution provided	Government of Indonesia	Ministry of Environment and	Indonesia
27523	14		14		Figure 1.2 to present energy-related CO2 emissions, and not use the term "FFI".	CO2-FFI is a key category and terminology, used also for Consistency with Chapter 2	Eleni Kaditi	Organization of the Petroleum	Austria
60709	15	1	15	9	A very interesting and informative figure which must be important to policymakers in each of the regions.	Thank you	Lourdes Tibig	Climate Change Commission,	Philippines
70249	15	1	15	5	the resolution of the graph is poor.	Figure with higher resolution provided	Phillippe Tulkens	European Union (EU) - DG Re	Belgium
4343	15	3	15	5	needs more recent data and Add few lines of inference	Noted	Alka Bharat	Maulana Azad National Instit	India
8953	15	3	15	9	Please clarify for Figure 1.3 how the plots in the figures are to be read. It is likely that some readers may be not familiar with this kind of schematisation.	Figure has been revised.	Francesco Gonella	Ca' Foscari University of Veni	Italy
11099	15	3	15	5	I love Figure 1.3 It tells a really useful story about current emissions. It would be nice to have a similar figure showing regional differences in trends over time.	Figure has been revised.	Anthony Patt	ETH Zürich	Switzerland
45683	15	3	125	9	Figure 1.3 mentions country groupings that seem to be based on the Annexes to the UNFCCC, which represents the levels of development in 1992, that is thirty years ago. In addition, the blocks use alternative country groups that are not explained in the caption. Searching the report, we found that Annex B specifies different country groupings, but it is not referenced here. This figure might use the "intermediate level" classification from AR5 WG III, which refers to the OECD countries classification from 1990, and which seems to lump together countries of very different level of development (it is impossible to read the text in the red box). This approach does not seem routed in a systematic scientific approach and we kindly request to delete this figure, to revise the country groupings and provide the key messages as text. Please see also our comment on the country groupings on the Entire Report.	Rejected. We are using country grouping based on region, not OECD, Non-OECD classification. This comment is not relevant to Figure 1.3	Government of Germany	Federal Ministry for the Envir	Germany
50429	15	3	15	9	Possible to have more updated data instead of 2004? The present emissions pattern for both population and GDP might be very different from 17 years ago. Especially the developing countries, the relatively lower emissions compared to the developed countries might have smaller gap now compared to that in 2004. The arguments based on these diagrams may not reflect the present (or recent years) conditions.	Rejected. Figure 1.3 is based on 2018 data. 2004 data is presented for the sake of comparison	Hoy Yen Chan	ASEAN Centre for Energy	Malaysia
85727	15	3	15	5	Suggest improving the quality of the figure 1.3. It is difficult or not possible to read some parts.	Figure with higher resolution provided	Government of Australia	Department of Industry, Scie	Australia
47315	15	4	15	5	figure 1.3 needs to be more illustrated because all contents are not readable	Figure with higher resolution provided	Khaled Mohamed Madkour	Ain Shams University, Cairo,	Egypt
29521	15	10	15	12	This is unclear, especially "energy / emissions per unit GDP". Please clarify.	Done	Government of Norway	Norwegian Environment Age	Norway
51913	15	10	15	15	The figure does not show the convergence or the relative change in European emissions per GDP as described here. A different figure should be cited instead, or drop the mention of figure 1.3b	Done. Reference to European emissions has been deleted.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
66749	15	12	15	13	The phrase the "biggest change is ... reduction in European emissions/GDP" is not clear from the figure. This needs to be described further in the text or the diagram needs to be clarified.	Done. Reference to European emissions has been deleted.	Navroz Dubash	Centre for Policy Research	India
65983	15	13	15	15	What about the contribution of the desindustrialisation of the EU to reducing GHG emissions?	This point is explained in Chapter 2.3.4.1	Yamina Saheb	OpenExp	France
12851	15	15	15	15	see chapter 2). Write Chapter with capital C	Done	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
8211	15		15		Is there a possibility to include figures where one could compare with previous time periods?	Figure has been restructured and revised	Frida Zahlander	DanChurchAid	Denmark
9831	15				Fig. 1.3 The figure is in a very low pixel quality. It should be changed with a clearer figure. The information in the red bar in both pictures are hardly understood.	Figure with higher resolution provided	Government of Indonesia	Ministry of Environment and	Indonesia
12853	16	4	16	4	case (chapter 2). Write Chapter with capital C	Revised, thank you	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
51871	16	4			The discussion compares the emissions of developing and developed countries. It concludes with a statement confirming that developed countries emissions barely changed since 2010 while rest of the world grew. However, developing countries emissions remain higher than other countries with 35% of global emissions. This is in addition to the 41% of developing countries emissions related to the exported product to developed countries. Thus, it should be clearly stated the percentage of total developed countries emissions at the end of the paragraph.	This paragraph is related to production based emissions.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
22705	16	6	16	6	in the sentence beginning with "While extreme poverty...", it would be necessary to add a precision "before the covid-19 pandemic is likely to lead to a re-emergence of poverty" since this is likely to cause an increase in poverty and means a backward step in terms of poverty reduction. see cross-chapter Box 1, 5.1.2, Box 5.1	Impact of COVID-19 on equality is clearly mentioned in the Box1	Government of France	Ministère de la Transition éco	France
27525	16	6	16	8	The argument on reduced extreme poverty to be updated considering the impacts of COVID-19.	Impact of COVID-19 on equality is clearly mentioned in the Box1	Eleni Kaditi	Organization of the Petroleum	Austria
49795	16	6	16	15	It should be noted that within country impacts also disproportionately effect Indigenous People particularly those communities still connected to traditional ways of living and food gathering.	We have now added a mention of this in the text, thank you	Chloe Hartley	Tsleil-Waututh Nation	Canada
51915	16	6	16	15	This whole paragraph is out of place since the focus of this section is on regional and global emissions. Omit or relocate in a relevant section.	We've attempted to revise the text for the FGD	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
45401	16	9	16	13	I would suggest to revise the following sentence, which seems incorrect and too convoluted: " Even if between10 country inequalities have decreased over recent decades, global warming has slowed the decrease (ibid), 11 because while 1°C of global warming can be positive or uncertain for cool countries, it has more 12 adverse impacts on growth win warm countries including most of the low-income countries (ibid), see 13 also section 1.5.6 below."	Thank you for your comment. The text has been structured into two sentences to enhance readability	Elena Verdolini	University of Brescia and Eur	Italy
45685	16	9	16	12	The statement "Even if between-country inequalities have decreased over recent decades, global warming has slowed the decrease, because while 1°C of global warming can be positive or uncertain for cool countries, it has more adverse impacts on growth win warm countries including most of the low-income countries." is not consistent with the WG II report. It is not correct that countries in temperate or colder climate zones do not suffer from climate impacts, even at 1°C, e.g., there are significant changes in extreme events and biodiversity loss. Please correct this statement.	Done. Deleted reference to positive impact on cool countries	Government of Germany	Federal Ministry for the Envir	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
60711	16	9	16	13	Something must be wrong-the word "win"	Done	Lourdes Tibig	Climate Change Commission	Philippines
79901	16	10	16	15	This sentence is not clear, suggest to perform consistency check and include sources.	Thank you for your comment. We have revised the paragraph.	Carlos Ruiz Garvia	UNFCCC	Panama
2975	16	12	16	12	Should read 'impacts on growth in warm...'	Done	Beth Edmondson	Federation University	Australia
54543	16	12	16	15	"win" should be "within"? Last sentence has a grammar issue: combinations of what?	Done	Government of United States of America	U.S. Department of State	United States of America
12855	16	13	16	13	also section 1.5.6 below. Delete the word below. Did not found any thing below.	Done	Amanullah Amanullah	Department of Agronomy, The	Pakistan
14439	16	16	16	16	should read "...for centuries, atmospheric concentrations...". Also, is it correct and most relevant to refer only to CO2 here rather than GHGs?	Thank you, edits made. We have chosen to write carbon dioxide because this gas can stay in the atmosphere for thousands of years, whilst some of the other GHGs such as methane have a much longer lifetime in the atmosphere	Joanna Depledge	Centre for Environment, Energy	United Kingdom (of Great Britain and Northern Ireland)
45687	16	16			ARS WG I FAQ give a much longer life time for CO2 - centuries to millennia. Please check.	Thank you for your comment. This reference has been removed as part of text editing for Final Draft	Government of Germany	Federal Ministry for the Environment	Germany
81141	16	16	16	21	This para needlessly confuses (but also fails to point out important differences) between net-zero CO2 and net-zero GHG targets (my comments on page 6 lines 12-15 and page 11 lines 1-9 refer).	Thank you for your comment. We have revised the paragraph as follows: An important recent development has been commitments to reach net zero greenhouse gas emissions. According to analysis done by Energy & Climate Intelligence unit on net-zero emissions (without specifying either CO2 or GHG emissions), as of July 2021, two countries have achieved net-zero emissions, twelve countries had legislated for net zero and another four are debating proposed legislation; another thirty seven have declared or are considering net zero goals in official policy documents (ECIU 2020). Furthermore, globally, net-zero targets (whether CO2 or GHG) have been adopted by about 823 cities and 101 regions (Chapter 8).	Andy Reisinger	Ministry for the Environment	New Zealand
83009	16	16	16	21	PA (Art. 4) is about net zero GHG, not CO2 only. Most (but not all: US & China) targets are on GHG, not CO2 only (which makes them more ambitious). You could refer to the discussion in ch3 (a new box) or Fuglestad et al 2018 (https://royalsocietypublishing.org/doi/full/10.1098/rsta.2016.0445) and/or Rogel et al. 2021 (Nature 591, "Three ways to improve net zero emissions targets")	Thank you, we now refer to Chapter 3 box: An important recent development has been commitments to reach net zero greenhouse gas emissions (Chapter 3, box). According to analysis done by Energy & Climate Intelligence unit on net-zero emissions (without specifying either CO2 or GHG emissions), as of July 2021, two countries have achieved net-zero emissions, twelve countries had legislated for net zero and another four are debating proposed legislation; another thirty seven have declared or are considering net zero goals in official policy documents (ECIU 2020). Furthermore, globally, net-zero targets (whether CO2 or GHG) have been adopted by about 823 cities and 101 regions (Chapter 8).	Geden Oliver	German Institute for International	Germany
86893	16	16	16	21	Regarding net-zero, it could also be mentioned that at least 823 cities and 101 regions (note: if comment is adopted, please check with Chapter 8 team before FGD, as numbers might have changed) have adopted net-zero declarations/goals (see Chapter 8 - Box 8.1).	Thank you for your comment. We have revised the paragraph as follows: An important recent development has been commitments to reach net zero greenhouse gas emissions. According to analysis done by Energy & Climate Intelligence unit on net-zero emissions (without specifying either CO2 or GHG emissions), as of July 2021, two countries have achieved net-zero emissions, twelve countries had legislated for net zero and another four are debating proposed legislation; another thirty seven have declared or are considering net zero goals in official policy documents (ECIU 2020). Furthermore, globally, net-zero targets (whether CO2 or GHG) have been adopted by about 823 cities and 101 regions (Chapter 8).	Meredith Keller	Yale University	United States of America
22707	16	17	16	17	for the ter "emission" we suggest to precise greenhouse gas emissions (instead of net emissions) here and in this paragraph	Thank you for your comment. We have revised the paragraph as follows: An important recent development has been commitments to reach net zero greenhouse gas emissions. According to analysis done by Energy & Climate Intelligence unit on net-zero emissions (without specifying either CO2 or GHG emissions), as of July 2021, two countries have achieved net-zero emissions, twelve countries had legislated for net zero and another four are debating proposed legislation; another thirty seven have declared or are considering net zero goals in official policy documents (ECIU 2020). Furthermore, globally, net-zero targets (whether CO2 or GHG) have been adopted by about 823 cities and 101 regions (Chapter 8).	Government of France	Ministère de la Transition écologique	France
8213	16	19	16	20	"Only 6 countries had legislated for net zero...". Please cross-check source, I believe this has been updated with additional countries legislated for net-zero.	Thank you for your comment. We have revised the paragraph as follows: An important recent development has been commitments to reach net zero greenhouse gas emissions. According to analysis done by Energy & Climate Intelligence unit on net-zero emissions (without specifying either CO2 or GHG emissions), as of July 2021, two countries have achieved net-zero emissions, twelve countries had legislated for net zero and another four are debating proposed legislation; another thirty seven have declared or are considering net zero goals in official policy documents (ECIU 2020). Furthermore, globally, net-zero targets (whether CO2 or GHG) have been adopted by about 823 cities and 101 regions (Chapter 8).	Frida Zahlander	DanChurchAid	Denmark
45403	16	19	16	21	Does this sentence reflect the EU efforts? Are EU member states accounted for separately or jointly? As of March 2021, the EU Commissions has put forward a proposal for a Climate Law	Thank you, the EU countries are separately considered in the figures provided in the following paragraph: An important recent development has been commitments to reach net zero greenhouse gas emissions (Chapter 3, box). According to analysis done by Energy & Climate Intelligence unit on net-zero emissions (without specifying either CO2 or GHG emissions), as of July 2021, two countries have achieved net-zero emissions, twelve countries had legislated for net zero and another four are debating proposed legislation; another thirty seven have declared or are considering net zero goals in official policy documents (ECIU 2020). Furthermore, globally, net-zero targets (whether CO2 or GHG) have been adopted by about 823 cities and 101 regions (Chapter 8).	Elena Verdolini	University of Brescia and European	Italy
51917	16	23	16	23	"these developments" what is meant by 'these' here? Rephrase.	This comment does not relate to page 16; line 23	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
80357	16	23	16	25	Passage: "However, these developments occur in an uncertain economic context, following strong growth in 2017 and early 2018.". This section starts by a reference to the final point of the previous section. However, the transition to "disorderly financial market developments" is not well connected. I suggest to have an introductory paragraph about what this subsection is about. Indeed it covers various things: economics, finance and the impact of covid. What I find confusing about the first two paragraphs is that I draw two interpretations, both problematic. The first is that it is the goal per se of reaching net zero emission that could be the source of disorder. This is not correct, it is a delayed and ill managed transition that is disorderly. The second, is that disorderly developments could prevent emission reductions. This may be true, but need to be explained and disentangled from the first problem.	removed in reorganisation	Stefano Battiston	University of Zurich	Switzerland
27527	16	25	16	27	The argument on trade disputes to be updated considering the new US administration.	Para removed	Eleni Kaditi	Organization of the Petroleum	Austria
45405	16	25	16	27	This sentence on trade disputes should be revised in the light of the developments until the final draft. Alternatively, the sentence could be written more in general terms, indicating the importance of taking into account trade-related aspect.	Para removed	Elena Verdolini	University of Brescia and European	Italy
2977	16	29	16	29	Should read "... on policies that yield immediate..."	Para removed	Beth Edmondson	Federation University	Australia
85729	16	29	16	30	Please include References to Kahler and Lake 2013 in the reference list.	Para removed	Government of Australia	Department of Industry, Science	Australia
4345	16	31	16	33	Add facts and figures	We tried adding.	Alka Bharat	Maulana Azad National Institute	India
60713	16	31	16	33	Isn't it possible to define confidence levels in these findings?	We do think it necessary to define confidence level for this statement.	Lourdes Tibig	Climate Change Commission	Philippines

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
6869	16	32	19	31	This box will benefit from close coordination with the COVID-19 box in Ch6 of WGI FGD.	Thank you, we have added the link to WGI cross chapter box.	Debra Roberts	EtheKwini Municipality	South Africa
2979	16	34	19	21	Valuable inclusion in this chapter. It is clear and effectively highlights intersecting tensions and dilemmas. However, on page 18, lines 9 and 10, it currently reads as though only 1 recovery path is envisaged for all states, and lines 9-24 seem exclusively concerned with affluent states. This apparent exclusion of developing and lower income countries seems at odds with earlier recognition of the importance of inequities and capacities gaps.	Thank you. I have edited the introductory phrase (page 18 lines 9-10) to clarify pathways are multiple. However, lines 9-24 show a global perspective, and public and private investment aspects apply to different countries at different stages of development.	Beth Edmondson	Federation University	Australia
4347	16	34	16	34	Add : Call on threats in future 'zootic' diseases' / 'Bioterrorism' (refer to Research in this domain) and cover the contents appropriately	Beyond scope of Mitigation report	Alka Bharat	Maulana Azad National Institute	India
14441	16	34	19	21	This box provides useful material, but it should be presented as a section, not a box. It doesn't make sense to have a "box" that covers 3 pages.	X-chapter box because it covers material across many chapters and has multiple authors	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
14443	16	34	19	21	Please make sure that literature covered in this Covid synthesis is up to date. I miss, for example, the special issue recently published in Energy Research & Social Science, Volume 68, 2020, 101701, ISSN 2214-6296, https://doi.org/10.1016/j.erss.2020.101701 .	Thank you, we are adding more literature to the assessment and the suggested reference has been cited.	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
45689	16	34	19	21	Cross-Chapter Box 1, Section on 'Integrating analyses': Is there a reason, why the 'One Health concept' hasn't been considered in the discussions as yet?	A reference for this comment would have helped	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
60715	16	34	21	19	There are a number of interesting and meaningful findings in Cross-chapter Box 1: The Covid-19 crisis: lessons, risks and opportunities. Congratulations to the writing team! However, we would like to see confidence levels in particular on risks.	Unfortunately the field is quite nascent and evolving, making this tricky. We have tried to be as specific as can be based on the literature.	Lourdes Tibig	Climate Change Commission	Philippines
75915	16	34			I suggest you add a couple of sentences about implications for Air Quality, GHG concentrations and on climate, as addressed in WGI Ch6 box on covid. And please add a reference to this box. Covid is a xWG issue and it is important to collaborate across WGs here. You may consider involving contributing authors from WGI and WGII here.	Thank you, we have cross referenced the WGI Chapter 6 Box 6.1.	Jan Fuglested	CICERO	Norway
79885	16	34	16	44	Additionally, suggest to provide a list of scientific quantified mitigation opportunities on post covid recovery scenarios.	Thank you, the literature is still incipient, but the existing literature has been assessed in Post-pandemic recovery pathways provide an opportunity to attract finance into accelerated and transformative low-carbon public investment (15.2, 15.6.3).	Carlos Ruiz Garvia	UNFCCC	Panama
85293	16	34	18	21	Excellent assessment on Covid-19 impacts, thank you. Please also consider the findings of the study by Leeds University (Piers et al, 2020) which found that including climate policy measures as part of an economic recovery plan with strong green stimulus could prevent more than half of additional warming expected by 2050 under current policies, and hence provide a good chance of global temperatures staying below the 1.5°C limit. https://doi.org/10.1038/s41558-020-0883-0	Thank you, this particular paper has been assessed and cited among others (please note it is cited as Forster et. al, 2020 since the authors name is Piers Forster).	Kaisa Kosonen	Greenpeace	Finland
86195	16	34	16	34	Please make a link toward the Cross-Chapter Box 6.1 in WGI report	Thank you, we have added the link.	Sophie Szopa	LSCE	France
22709	16	41	16	41	Concerning the statement "are expected to rebound in 2021-2022", following ongoing developments of the pandemic (increasing number of cases, re-confinements, travel bans and flight-restrictions, etc.), it is unlikely that human activity restarts as before by the end of 2021, perhaps beyond. To avoid statements that may reveal untrue in the near future, we suggest that this portion of the sentence can be changed to "... to rebound after the pandemic is contained, ...".	Thank you. While it is true that most activities will not return to previous pathway until the pandemic is contained, some rebound effect has already been observed and the International Energy Agency in 2021 projects a rebound in 2021-2022, so this reference has been cited.	Government of France	Ministère de la Transition écologique	France
45407	16	41	16	41	The sentence "While emissions and most economies are expected to rebound in 2021-2022," should be updated if the project change in the next few months	Thank you. While it is true that most activities will not return to previous pathway until the pandemic is contained, some rebound effect has already been observed and the International Energy Agency in 2021 projects a rebound in 2021-2022, so this reference has been cited.	Elena Verdolini	University of Brescia and Eurochem	Italy
25077	16	42	16	42	Not clear which emission drivers is meant here?	Thank you, we have rephrased.	Minal Pathak	WGIII TSU, Ahmedabad University	India
8879	17	1	17	16	Pandemic lessons learned: may be worth mentioning emerging research on potential role of climate change in covid-19 pandemic due to species migration. https://www.sciencedirect.com/science/article/pii/S0306261920303603	Thank you, but this is beyond the scope of the mitigation report.	Seth Dunn	ServiceMax	United States of America
19973	17	1	17	3	Van der Voorn et al (2020) have drawn important lessons from the Covid19 pandemic to tackle the water crisis and climate change. See e.g., van der Voorn, T.; van den Berg, C.; Bhattacharya, P.; Quist, J., Never Waste a Crisis: Drawing First Lessons from the COVID-19 Pandemic to Tackle the Water Crisis. ACS ES&T Water 2020. https://doi.org/10.1021/acsestwater.0c00041	Thank you, but this is beyond the scope of this box.	Tom van der Voorn	Institute of Environmental Studies	Netherlands
20135	17	1	17	16	A large discussion on lessons learnt from the pandemic and how that should affect climate change and policy analysis in Section 4, here: Nikas A., Gambhir A., Trutnevtey E., Koasidis K., Lund H., Thellufsen J.Z., Mayer D., Zachmann G., Miguel L.J., Ferreras-Alonso N., Sognaes I., Peters G.P., Colombo E., Howells M., Hawkes A., van den Broek M., Van de Ven D.J., Gonzalez-Eguino M., Flamos A., & Doukas H. (2021). Perspective of comprehensive and comprehensible multi-model energy and climate science in Europe. Energy, 215, 119153.	Thank you, but this is beyond the scope of this box. A discussion about modelling is conducted in chapter 15 section Box 15.6.3.	Nikas Alexandros	National Technical University of Athens	Greece
45691	17	3	17	6	It is suggested to consider the IPBES workshop report on biodiversity and pandemics which states: "The risk of pandemics is increasing rapidly, with more than five new diseases emerging in people every year, any one of which has the potential to spread and become pandemic" (IPBES 2020: 5) According to the report the pandemic risk is linked to increasing anthropogenic changes such as unsustainable exploitation of wildlife and climate change. See for more: IPBES (2020) Workshop Report on Biodiversity and Pandemics of the Intergovernmental Platform on Biodiversity and Ecosystem Services. Daszak, P. et al., IPBES secretariat, Bonn, Germany, DOI:10.5281/zenodo.414731	Thank you, but we would need more literature to add a statement.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
12857	17	13	17	13	(Klener et al., 2020) offer. No need to write et al. as italic be uniform in whole text.	Corrected, thank you.	Amanullah Amanullah	Department of Agronomy, The University of Agriculture, Faisalabad	Pakistan
12859	17	13	17	13	(Klener et al., 2020) offer. Donot start sentence with bracket.	Thank you, corrected.	Amanullah Amanullah	Department of Agronomy, The University of Agriculture, Faisalabad	Pakistan
12861	17	13	17	13	bring uniformity in whole text for et al., or et al. when inside bracket. I mean sometime comma is given after dot or remove comma after dor. But depends on IPCC style. I personally/technical recommend comma as et al., 2020)	Corrected, thank you.	Amanullah Amanullah	Department of Agronomy, The University of Agriculture, Faisalabad	Pakistan
9839	17	17		20	While data have shown and we have learnt that behaviour, such as mobility which brings result in transportation and industry, can be changed towards more environmentally sustainable impacts, it is crucial to address how to maintain the society behaviour in such manner or to find balance between the necessity of being mobile and being static at home while taking advantage of IT in conducting daily tasks.	Thank you. Citing style is indeed determined by the IPCC, so the chapter does not choose style.	Government of Indonesia	Ministry of Environment and Forestry	Indonesia
50541	17	17	17	17	Cross chapter box 6.1 on COVID, in chapter 6 of AR6 WG1, has a more detailed text on emission reduction due to the pandemic. It could be referenced here.	Thank you, reference to Box 6.1 WGI added.	Anne Marie Treguier	CNRS	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
72421	17	17	17	33	There is a strong emphasis on person air transport but little is said on the air cargo. These two types of air transport have been affected in different ways by the COVID-19 pandemic. While air passenger transport has notably decreased, air cargo has on yearly average only slightly decreased (-11.6% on million tons compared to 2019) and has actually increased in the second half of the year (see IATA reports such as: https://www.iata.org/en/iata-repository/pressroom/fact-sheets/industry-statistics/ ; https://www.iata.org/en/iata-repository/publications/economic-reports/air-freight-monthly-analysis---december-2020/ (see also other months) ; Nizetic S. (2020) Impact of coronavirus (COVID-19) pandemic on air transport mobility, energy, and environment: A case study, International Journal of Energy Research 44, 10953-10961, 10.1002/er.5706). This may be linked to new habits such as online ordering that have grown due to the pandemic. These aspects and their potential consequence on GHG releases are not discussed at all in this section. Air cargo is a not a negligible contributor to global air traffic and thus its specificity should be discussed here.	Thank you, we have added a phrase and the suggested reference.	Sylvain Pichat	University of Lyon, Ecole nor	Germany
74077	17	18	17	18	This numbers in the parentheses don't make sense in this sentence "emissions from fossil fuel use and industry fell about 7% (2.7-13%) from 2019 to 2020."	Updated and clarified.	Beate Antonich	Center for Climate Change, E	United States of America
17965	17	21	17	22	The sentence "Initial projections suggest emissions may be around 4-5.5% below a 'no-pandemic' baseline by 2024 (Shan et al 2020) does not seem to be consistent with the source material. The parts of Shen et al. comparing emissions to a 'no-pandemic' baseline assess the impact on emissions over a five-year period, from 2020-2024 (e.g. "Total emissions of 79 countries will decrease by 3.9 to 5.6% in 5 yr (2020 to 2024), compared with a no-pandemic baseline"), but Figure 1 shows that by 2024, emissions would have returned to the 'no-pandemic' baseline level. The text as it stands suggests 2024 emissions would still be below the baseline, not having reduced below the baseline before returned to it. This should be clarified, and the effect of any economic stimuli should be stated clearly and separately.	Thank you, I have clarified in the text that 7% is an average of the different results spanning from 2.7 to 13%.	Government of United Kingdom (of Great Britain and Northern Ireland)	Department for Business, Energy and Industrial Strategy	United Kingdom (of Great Britain and Northern Ireland)
22711	17	28	17	29	The claim that "the virus is carried on diesel particles" appears to be unsubstantiated given the references (the problematic term being "diesel"). Wu et al. makes no mention of diesel and while Gudka et al. does mention diesel particles, what is described is a correlation between particulate matters and the virus as well as the presence of (part of) the virus in some particulate matter. While the suspicion is legitimately high, there is however no proof that the particulate matter was from diesel exhaust (in particular, the sampling method was not described). Please add references or change the wording.	Thank you, we have removed the phrase.	Government of France	Ministère de la Transition écologique et solidaire	France
86197	17	28	17	30	The role of pollution as a vector as not been proven (WMO is coordinating a assessment report on that which should be made public early in 2021, the contact point is climatehealthoffice@wmo.int). By the way, I recommend to remove this sentence.	Thank you, we have deleted the sentence.	Sophie Szopa	LSCE	France
86199	17	28	17	30	The interesting point linking air pollution and covid is rather its increase effect on health when occurring in polluted areas, due to compounds effects but also generally due to less good health conditions of people leaving in polluted areas (as said in your chapter 3 "The health effects of pollution are most frequent and severe among the socially disadvantaged communities (Hajat et al. 2015; Landrigan et al. 2018).".	Thank you, we have deleted the sentence.	Sophie Szopa	LSCE	France
6871	17	30	17	30	What does exceptionally large mean? Please quantify and let the reader decide whether the reported reduction is exceptional, low, or moderate.	Thank you, we have changed the language and referred to other chapters quantifying such impacts.	Debra Roberts	EThekwin Municipality	South Africa
85353	17	30	17	30	The (COVID) impacts on aviation have been exceptionally large, particularly for the international air travel, and are projected to extend not just through behavioural changes, but also with fleet changes associated with retiring older planes, and reduced new orders indicating expectations of reduced demand and associated GHG emissions until 2030.	We don't understand the comment since it is a copy of the text.	Neil Dickson	ICAO	Canada
85291	18	1	18	6	These are very important and policy relevant findings that would merit to be lifted to the SPM.	Thank you, noted.	Kaisa Kosonen	Greenpeace	Finland
12863	18	3	18	3	during 2020 (Bloomberg/Ameli, 2020). Correct it Bloomberg/Ameli no need to write two names for one author.	Thank you. Corrected.	Amanullah Amanullah	Department of Agronomy, The University of Agriculture, Faisalabad	Pakistan
27531	18	6	18	7	Delete "within which there is growing attention to 'Net Zero' as a guide or goal for future major investment decisions", as this is not a policy-neutral statement.	Thank you, we have deleted the sentence.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
27533	18	13	18	17	Delete "There are clear reasons why a low-carbon response can create more enduring jobs, better aligned to future growth sectors: by also crowding-in and reviving private investment (e.g. from capital markets and institutional investors, including the Growing profile of Environment and Social Governance (ESG) and green bond markets (15.6)), this can boost the effectiveness of public spending (IMF, 2020).", as this is not a policy-neutral statement.	Thank you. This actually refers to a growing interest within the private sector particularly, it does not refer to public policy.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
73081	18	21	18	22	The paper Politt ea cited as "under review" is unpublished and cannot be accessed. It is thus hard for readers to understand what it refers to and access the content of the manuscript. Thus, for sake of transparency, it should be removed if no published updated version is available.	Thank you, it has now been published.	Irene Monasterolo	Vienna University of Economics and Business	Austria
4701	18	25	18	36	See also the covid policy tracker report of Milena Buchs, linked here https://wellbeingeconomy.org/ten-principles-for-building-back-better-to-create-wellbeing-economies-post-covid	Noted, but not an appropriate reference for IPCC.	Julia Steinberger	University of Lausanne	Switzerland
75777	18	25	18	36	It would be great if the 35% of spending on low-carbon energy can be put in context with the total investments required in the next decade (from another chapter). Another angle that can be added to the paragraph are policies that have been put in place for structural change rather than investment flows only since those long-term policy changes are the ones having the largest influence	Beyond scope of the box, please see chapter 15.	Herib Blanco	International Renewable Energy Agency	Germany
12865	18	29	18	29	16th December 2020. super cript th	Thank you, it has been deleted.	Amanullah Amanullah	Department of Agronomy, The University of Agriculture, Faisalabad	Pakistan
27535	18	31	18	33	Delete "for example as part of 'Green New Deal' (Box 13.10; see also Oh et al. (in review) for overview of Korea, EU and US GNDs in context of COVID-19", as the GND in the USA is not adopted.	Corrected, thank you.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
70113	18	31			This 'brown' allocation of recovery funds risks increasing 2020-2024 emissions by up to 15.5% above a 'no-pandemic' baseline by 2024 versus a potential decrease of 4.7% under a 'green' recovery path (Shan et al 2020)	Thank you, we added an updated reference (Reilly et al. 2021).	Rayner Andersen	Department of Fisheries and Aquaculture	Canada
45409	18	37	18	37	Line 37 is empty	Corrected, thank you.	Elena Verdolini	University of Brescia and European Commission	Italy

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
27537	18	44	18	46	Delete "green' versus 'brown' recovery has corresponding distributional consequences between these and 'green' producers, suggesting need for differentiated policies with international coordination (le Billon et al., in revision).", as this is not a policy-neutral statement.	Corrected, thank you.	Eleni Kaditi	Organization of the Petroleum	Austria
73095	18		18		The reference "Bloomberg/Amel, 2020" is not a reference. It reads as the access to a Bloomberg terminal: "Bloomberg terminals, S&P 500 Index composition and returns. Data accessed 13 in September 2020. From N.Amel et al, in review with Nature Climate Change".? If the reference is the latter on Nature Climate Change, the paper is not published nor available online as a working paper. Thus I wonder how could readers/reviewers understand the contribution to the chapter. This is not a citable source, remove it.	Thank you, the paper has now been published and cited as such.	Irene Monasterolo	Vienna University of Econom	Austria
8215	19	1	19	21	Suggesting to also include the aspect of societies collaboration and their ability to achieve something. If the society has been able to change behaviors for the purpose of mitigation the spread of COVID-19, why shouldn't this be possible to mitigate climate change?	Thank you, but this is beyond the scope of the box.	Frida Zahlander	DanChurchAid	Denmark
20047	19	1	19	21	See also: Nikas A., Gambhir A., Trutnevte E., Koasidis K., Lund H., Thellufsen J.Z., Mayer D., Zachmann G., Miguel L.J., Ferreras-Alonso N., Sognnaes I., Peters G.P., Colombo E., Howells M., Hawkes A., van den Broek M., Van den Ven D.J., Gonzalez-Eguino M., Flamos A., & Doukas H. (2021). Perspective of comprehensive and comprehensible multi-model energy and climate science in Europe. Energy, 215, 119153.	Thank you, this is beyond the scope of the covid box, please see chapter 15 section 15.6.3.	Haris Doukas	National Technical University	Greece
22713	19	1	19	1	with regard to the lessons to be learned from the covid 19 crisis, the cross-chapter box 1 balances major risks (gas pedal effect) but also opportunities (notably for action). We suggest first, a synthesis diagram (such as mindmap) would help us to better understand this issue and also that this analysis should be taken up more widely.	Thank you, this is beyond the scope of the covid box..	Government of France	Ministère de la Transition éc	France
6873	19	3	19	4	Please support this statement with evidence.	Thank you, we have removed the phrase.	Debra Roberts	EThekwni Municipality	South Africa
6875	19	7	19	10	This should be contrasted with the global response to the pandemic which is not collective. Emerging evidence reveals that countries are putting their national interests first. If anything, the lessons from the COVID-19 vaccination procurement should make us worry about the case of multi-level governance that is now being advocated as ideal for a global issue such as climate change. If we experience a large-scale climate change catastrophe, we will likely see the type of responses that we are witnessing now i.e. with wealthy countries using their resources to protect themselves at the expense of others (in this case through amassing vaccines in excess of their needs). If anything, responses to the pandemic are state-centric rather than collective. This is an important lesson in the response to COVID-19 that should be applied to climate change.	Reference added, thank you.	Debra Roberts	EThekwni Municipality	South Africa
12867	19	7	19	7	Geels (2019)). Lessons. Remove extra bracket	Thank you, corrected.	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
5185	19	10	19	10	Other authors claims that Covid crisis has slowed down the development of new energy sources, mainly for electricity production. Your statement should be moderated.	Thank you, but the second bracket is needed to close two brackets opened.	Michel SIMON	Retraité/ Pdt d'association	France
4703	19	11	19	23	Would be good to mention low (energy) demand scenarios here too: Grubler et al 2018, Millward-Hopkins et al 2020.	I don't see the COVID box as place to mention - do we really want to associate low demand with forced lockdown?	Julia Steinberger	University of Lausanne	Switzerland
25079	19	15	19	15	Paris Agreement processes? Not clear	Thank you, rephrased.	Minal Pathak	WGIII TSU, Ahmedabad Univ	India
27539	19	29	19	35	Delete "Potential economic multiplier benefits of clean investment could be amplified all the more insofar as they help to build the industries and infrastructures for further clean growth (Hepburn et al. 2020). In practice however, the current orientation of COVID-19 recovery packages is very varied, pointing to a very mixed picture about whether or not countries are exploiting this opportunity (see Cross-Chapter Box 1). Moreover, whilst in theory very low interest rates should support green investment, the large public debts – including bringing some developing countries close to default - undermine both the political appetite and feasibility of large-scale clean investments.", as these are captured in the Cross-Chapter Box.	Significantly shortened but the box ref is set more generally?	Eleni Kaditi	Organization of the Petroleum	Austria
50543	19	38	19	38	PV needs to be defined.	Para deleted	Anne Marie Treguier	CNRS	France
78749	19	38	19	42	this is a most important change, but more information shall be provided why this has not yet more impact in the IPCC community! First the total PV potential is up to 70 GW according to Haegel et al. (https://science.sciencemag.org/content/364/6443/836), which is fully unreflected in the IAM world; second, the IAM community has a negative bias against solar energy as clearly concluded in Jaxa-Rozen (https://www.nature.com/articles/s41558-021-00998-8) which is a MUST to be better reflected in the AR6 so that such failures within the IAM community can be fixed, as the non-IAM community seems to be not affected by such a strong bias; third there are substantial methodological issues in IAMs, which block the IAM community to find lower-cost solutions more based on low-cost solar energy, as clearly concluded in Victoria et al. (2021, Solar photovoltaics is ready to power a sustainable future, Joule, in press). All this requires more room in this section, this chapter and the entire AR6.	Coverage improved in the final draft of overall report including modeling	Christian Breyer	LUT University	Finland
29523	19	40	19	42	Reporting of solar PV as "the cheapest electricity in history" with reference to the IEA 2020 World Outlook needs to be nuanced/supplemented by new methodology for estimating the competitiveness of energy technologies. For example, Value Adjusted Levelised Cost of Energy (VALCOE) that estimates the value of the multiple system services technologies can provide in the context of the regional power mix at that time. More specifically, the VALCOE captures the value of three system services: energy value, flexibility value and capacity value by technology. Reference: IEA and NEA Projected Cost of Generating Electricity 2020 Edition.	This is more a Chapter 6 than Chapter 1 intro issue	Government of Norway	Norwegian Environment Age	Norway
78271	19	40	19	40	literature subsequent to SRREN was also used	Clarified	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
51919	19	41	19	41	Omit the phrase "the cheapest electricity in history". Later in the same paragraph it indicates that the cost competitiveness varies by region	added, 'in many regions'	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
77173	19	41	19	41	As per IEA WEO, the statement that PV is now 'the cheapest electricity in history' holds true not only due to technology gains, but also to "low financing costs enabled by revenue support mechanisms". These conditions, as in the IEA WEO, should be reported here as well: omitting this clarification makes the sentence misleading.	Unnecessary addition for the Intro chapter.	Giacomo Grasso	ENEA	Italy

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
5187	19	47	19	47	Add a sentence after the brackets, stating: "Costs reduction is due to several factors. Beyond the technological improvements, production costs have benefitted of privileged commercial conditions, like priority access to the networks, taking off obligations whenever the MWh is produced, public subsidies, etc.... It also must be observed that a fair comparison of the price of MWh produced by fossils (or hydro, or nuclear) and renewable should oblige to add the cost of storage (or alternative source of supply) to renewable costs. With that fair comparison, fossils remain by far the cheapest source of energy; this the reason why the fossils remain the primary source of energy. On the other hand, development of thermal renewable and namely solar thermal has been less supported by most governments."	These are complex issues - balancing costs for example remain small at lower penetration - and overall, too much detail for Intro - this is not the Energy, Policy or Finance chapter. And the basic statement about dramatic reductions in solar PV costs remains correct	Michel SIMON	Retraité/ Pdt d'association	France
12869	19	47	19	47	(chapter 6, 9, 12). Write as (Chapters 6, 9, 12).	Thanks	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
25085	19	47	20	2	Technological developments in green hydrogen and CO2 based fuels- are these as rapid as the earlier examples of batteries and EVs?	As yet we don't know - they are at an earlier stage - see eg. Industry chapter	Minal Pathak	WGIII TSU, Ahmedabad Unive	India
74157	19	47	20	2	The discussion of technological developments misses the development of non-light water advanced nuclear reactors. Ontario Power Generation will be downselecting one of three advanced reactor designs this spring for deployment at the Darlington site in Ontario. https://www.opg.com/innovating-for-tomorrow/small-modular-nuclear-reactors/ Additionally, the U.S. Department of Energy selected two technologies developed by TerraPower and X-energy for its Advanced Reactor Demonstration Program, both of which will be built in Washington State at the existing EnergyNorthwest nuclear site. https://www.energy.gov/ne/nuclear-reactor-technologies/advanced-reactor-demonstration-program These are specific projects that are not theoretical. For these reasons, advanced nuclear technologies should be reflected in this reference.	We have made a reference to new nuclear in 1.4.4 but there have not been commercial or deployment developments that remotely match those of renewables	Jeffrey Merrifield	Pillsbury Law Firm	United States of America
47953	19	49	19	49	The electric vehicle "revolution" is mentioned but not really highlighted as one of the major recent change in the mitigation space. https://www.iea.org/reports/global-ev-outlook-2020 ; https://doi.org/10.1088/2516-1083/abe0ad	We say a bit more in section 1.4.4 and of course the Transporth chapter	Matteo Muratori	NREL	United States of America
10487	20	1	20	2	It is not easy to see the articulation between shale revolution and progress in CCS	True, sentence deleted	Philippe Waldteufel	CNRS	France
51873	20	1			The discussion brings in the shale oil as new fossil fuel resources and undermines the possibilities of utilizing the CCS. First, the statement is not of high evidence level plus, the utilization of CCUS has been emphasized in other chapters positively as an important tool. Rewrite the statement considering the above.	Sentence removed here, brief discussion in 1.4.4	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
10197	20	4	20	45	In "Other Social and Political Trends" some mention is made of internet and social media fostering large-scale organising - fair enough, but the flipside is that societies may find themselves polarising at precisely the wrong moment, as the business models of social media giants tend towards sharing content that provokes fear, outrage, anxiety and disgust among platform users, potentially rendering us incapable of establishing common ground on key policies.	Rejected. This may be an argument, but this is just a short description of trends and we do not go into this discussion here.	Gary Kendall	Nedbank	South Africa
25081	20	4	20	45	Does a short para on countries' net zero pledges belong to this section?	Rejected. We do not think so as this is a subsection on trends and not on pledges. We see pledges more as how the governments follow up the Paris Agreement.	Minal Pathak	WGIII TSU, Ahmedabad Unive	India
29525	20	5	20	7	Is this statement up-to-date, re the 2020 US election and other national elections?	Accepted. We have rephrased this sentence.	Government of Norway	Norwegian Environment Age	Norway
86895	20	7	20	10	Good to raise the implication on climate change mitigation of the growing political trends we're seeing globally (e.g., nationalism, populism, etc.) - so important to the discussion of prospective mitigation. Thank you for doing so.	Thanks.	Meredith Keller	Yale University	United States of America
1987	20	11	20	34	The discussion of the role of civil society is extremely limited. Because of its narrow focus on the school strikes and activism by the Vatican, it provides an extremely selective analysis of the extensive role of civil society in climate action. There are three areas where this discussion needs to be revised.	See specific comments below.	Robert Brulle	Brown University	United States of America
1989	20	11	20	34	First, the climate movement is much broader than depicted in this text, and there is ample scholarship that discusses this. This part of the report needs to be completely rewritten to accurately reflect scholarship in this area. See the references below:	Thank you for the point and references. IPCC needs to address a vast array of issues, we touch on a range of social and cultural dimensions, and we believe this is the first report to have a specific recognition (and subsection) of the importance of political factors and need for political analysis, and there is substantial analysis of some related 'climate movement' issues not least in Chapters 5 and 13. We have made revisions to our relevant sections, see specific responses on some of your comments. In general though the relevant sections had to be shortened, so we could not add much.	Robert Brulle	Brown University	United States of America
1991	20	11	20	34	Bäckstrand, K. and E. Lövbrand. 2007. Climate Governance Beyond 2012: ", pp. 123-148 in Pettenger, M. ed. The Social Construction of Climate Change. Ashgate, Hampshire UK	Rejected. This is an old paper and does not describe the current trend.	Robert Brulle	Brown University	United States of America
1993	20	11	20	34	Bäckstrand, K. and E. Lövbrand. 2016. The Road to Paris. Journal of Environmental Policy & Planning 1-19.	Accepted.	Robert Brulle	Brown University	United States of America
1995	20	11	20	34	Brulle, Robert J. 2014. The Development, Structure, and Influence of the U.S. National Climate Change Movement in Climate Change Policy and Civil Society. Y. Wolinsky (Ed) Washington DC: CQ Press	Rejected. This is also before AR5, and we struggled to find this chapter on the net.	Robert Brulle	Brown University	United States of America
1997	20	11	20	34	Caniglia, Beth, R. Brulle, and A. Szasz. 2015. Chapter Ten in R. Dunlap and R. Brulle (Eds.) Sociological Perspectives on Climate Change Oxford: New York	Rejected. This is too general.	Robert Brulle	Brown University	United States of America
1999	20	11	20	34	Cheon, A. and J. Urpelainen. 2018. Activism and the Fossil Fuel Industry. New York: Routledge	Accepted	Robert Brulle	Brown University	United States of America
2001	20	11	20	34	Della Porta, D. and L. Parks. 2014. Framing Processes in the Climate Movement, pp. 19 – 30 in M. Dietz and H. Garrelts (Eds.) Routledge Handbook of the Climate Change Movement. Routledge: New York	Rejected. This is too general.	Robert Brulle	Brown University	United States of America
2003	20	11	20	34	Endres, D., L. Sprain, and T Peterson (Eds.) 2009. Social Movement to Address Climate Change. Amherst, NY: Cambria Press.	Rejected. This is an old reference that came before AR5.	Robert Brulle	Brown University	United States of America
2005	20	11	20	34	Hadden, J. 2015. Networks in Contention. Cambridge, London	Rejected. This is too general.	Robert Brulle	Brown University	United States of America

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2007	20	11	20	34	Second, the discussion of resistance to climate change action is so partial as to be misleading. It fails to address the vast literature regarding the decades long organized resistance to climate action. Instead, it only mentions two incidents involving labor opposition to climate action. In this regard, the work of Mildenberger (2020) focuses on the role of labor unions as part of a complex efforts to resist climate action. Moreover, an extensive peer reviewed literature shows that a large number of corporations and trade associations, acting in coordination with conservative think tanks, foundations, trade associations, and public relations firms, mounted a long-term effort to oppose action to mitigate carbon emissions (Anderson et al. 2017, Dunlap and Brulle 2020, Dunlap and Jacques 2013, Dunlap and McCright 2011, 2015; Plehwe 2014; Brulle 2014, 2018; 2019, 2020, Brulle and Aronczyk 2019, Brulle et al. 2012 Brulle et al. 2020, Farrell 2016a, 2016b, Jacques et al. 2008, McCright and Dunlap 2000, 2003).	Resistance by corporations and trade unions has been added with some literature (including Mildenberger). This issue is also discussed in 1.4.5 Political Economy, as well as a key dimension of our fourth Analytic Framework	Robert Brulle	Brown University	United States of America
2009	20	11	20	34	Anderson, D. M. Kasper, D. Pomerantz, (2017). Utilities Knew: Documenting Electric Utilities' Early Knowledge and Ongoing Deception on Climate Change From 1968-2017. Energy and Policy Institute.	See our responses to your First and Second general points - thanks.	Robert Brulle	Brown University	United States of America
2011	20	11	20	34	Brulle, RJ 2014. Institutionalizing delay: foundation funding and the creation of US climate change counter-movement organizations. <i>Climatic Change</i> , 122(4), 681-694.	Accepted	Robert Brulle	Brown University	United States of America
2013	20	11	20	34	Brulle, RJ 2018, 'The climate lobby: A sectoral analysis of lobbying spending on climate change in the United States – 2000 to 2016', <i>Climatic Change</i> , vol. 149, pp. 289–303.	See response to comment ID 2007	Robert Brulle	Brown University	United States of America
2015	20	11	20	34	Brulle, RJ 2019, 'Networks of opposition: A structural analysis of US climate change countermovement coalitions 1989–2015', <i>Sociological Inquiry</i> . doi: 10.1111/soin.12333.	Accepted	Robert Brulle	Brown University	United States of America
2017	20	11	20	34	Brulle, RJ 2020, Denialism: Organized opposition to climate change action in the United States. In <i>Handbook of US Environmental Policy</i> . Edward Elgar Publishing.	See our responses to your First and Second general points - thanks.	Robert Brulle	Brown University	United States of America
2019	20	11	20	34	Brulle, RJ & Aronczyk, M 2019, 'Organized opposition to climate change in the United States', in A Kalfagianni, D Fuchs & A Hayden (Eds), <i>Routledge Handbook of Global Sustainability Governance</i> , Routledge, New York, pp. 218–229.	See our responses to your First and Second general points - thanks.	Robert Brulle	Brown University	United States of America
2021	20	11	20	34	Brulle, RJ, Aronczyk, M & Carmichael, J 2020, 'Corporate promotion and climate change: An analysis of key variables affecting advertising spending by major oil corporations, 1986–2015', <i>Climatic Change</i> , vol. 159, pp. 87–101.	See our responses to your First and Second general points - thanks.	Robert Brulle	Brown University	United States of America
2023	20	11	20	34	Brulle, RJ, Carmichael, J. & Jenkins, J.C. 2012. 'Shifting public opinion on climate change: an empirical assessment of factors influencing concern over climate change in the US, 2002-2010' <i>Climatic Change</i> , 114(2): 169–188.	See our responses to your First and Second general points - thanks.	Robert Brulle	Brown University	United States of America
2025	20	11	20	34	Dunlap, RE & Brulle, RJ (2020). Sources and amplifiers of climate change denial. In <i>Research Handbook on Communicating Climate Change</i> . Edward Elgar Publishing.	See our responses to your First and Second general points - thanks.	Robert Brulle	Brown University	United States of America
2027	20	11	20	34	Dunlap, RE & Jacques, PJ 2013, 'Climate change denial books and conservative think tanks: Exploring the connection', <i>American Behavioral Scientist</i> , vol. 57, pp. 699–731.	Rejected. This is before AR5	Robert Brulle	Brown University	United States of America
2029	20	11	20	34	Dunlap, RE & McCright, AM 2011, 'Organized climate change denial', in J Dryzek, R Norgaard & D Schlosberg (eds), <i>The Oxford Handbook of Climate Change and Society</i> , Oxford University Press, Oxford, pp. 144–160.	Rejected. This is before AR5	Robert Brulle	Brown University	United States of America
2031	20	11	20	34	Dunlap R. and A. McCright (2015). Challenging climate change: the denial countermovement. In: Dunlap R, Brulle RJ (eds.) <i>Climate change and society: Sociological perspectives on climate change</i> (pp. 300–332). Oxford University Press, New York	See our responses to your First and Second general points - thanks.	Robert Brulle	Brown University	United States of America
2033	20	11	20	34	Farrell, J. (2016a). Network structure and influence of climate change countermovement. <i>Nature Climate Change</i> 6(4) 370-374.	See our responses to your First and Second general points - thanks.	Robert Brulle	Brown University	United States of America
2035	20	11	20	34	Farrell, J. (2016b). Corporate funding and ideological polarization about climate change. <i>Proceedings of the National Academy of Sciences</i> 113(1), 92-97.	See our responses to your First and Second general points - thanks.	Robert Brulle	Brown University	United States of America
2037	20	11	20	34	Jacques, Peter J., Riley E. Dunlap, and Mark Freeman. 2008. "The Organization of Denial: Conservative Think Tanks and Environmental Scepticism." <i>Environmental Politics</i> 17:349-385.	Rejected. This is too old	Robert Brulle	Brown University	United States of America
2039	20	11	20	34	McCright, AM & Dunlap, RE 2000, 'Challenging global warming as a social problem: An analysis of the conservative movement's counter claims', <i>Social Problems</i> , vol. 47, pp. 499–522.	Rejected. This is too old	Robert Brulle	Brown University	United States of America
2041	20	11	20	34	McCright, AM & Dunlap, RE 2003, 'Defeating Kyoto: The Conservative movement's impact on US climate change policy', <i>Social Problems</i> , vol. 55, pp. 348–373.	Rejected. This is too old	Robert Brulle	Brown University	United States of America
2043	20	11	20	34	Mildenberger, M. (2020). Carbon captured: How business and labor control climate politics. MIT Press.	Referenced	Robert Brulle	Brown University	United States of America
2045	20	11	20	34	Plehwe, Dieter. (2014). Think tank networks and the knowledge-interest nexus: The case of climate change. <i>Critical Policy Studies</i> 8(1):101-115.	Rejected. This is before AR5	Robert Brulle	Brown University	United States of America
2047	20	11	20	34	Third, the discussion fails to even mention the role of foundations in the funding of social movements either supporting or opposing climate action (Brulle 2014, Morena 2016, 2020, Nisbet 2018). The role of foundation funding is a critical component in the creation and maintenance of social movements for or against climate action, including the ongoing school strike (funded in part by the European Climate Foundation). A careful consideration of this aspect of civil society is needed for this section to accurately reflect the literature on civil society.	Rejected. While we think that it is important to be open about sources for funding, we do not think it is important to mention this in this very short list of social trends. Chapter 13 and 14 go into more details on these trends, and we refer to these chapters here.	Robert Brulle	Brown University	United States of America
2049	20	11	20	34	Morena, E. 2016. The price of climate action: Philanthropic foundations in the international climate debate. Springer.	See responses to your comment ID 2007 and your third general comment 2047	Robert Brulle	Brown University	United States of America
2051	20	11	20	34	Morena, E. 2020. The climate brokers: philanthropy and the shaping of a 'US-compatible'/international climate regime. <i>International Politics</i> , 1-22.	See responses to your comment ID 2007 and your third general comment 2047	Robert Brulle	Brown University	United States of America
2053	20	11	20	34	Nisbet, M. C. 2018. Strategic philanthropy in the post-cap-and-trade years: Reviewing US climate and energy foundation funding. <i>Wiley Interdisciplinary Reviews: Climate Change</i> , 9(4).	See responses to your comment ID 2007 and your third general comment 2047	Robert Brulle	Brown University	United States of America
6877	20	11	20	23	Beyond activism, this paragraph should consider the practical climate action by these groups.	Rejected. We need to keep this paragraph short.	Debra Roberts	EThekweni Municipality	South Africa
11101	20	11	20	23	Cross references to chapters 13 and 14 here.	Accepted	Anthony Patt	ETH Zürich	Switzerland
22715	20	11	20	11	We suggest to add in this paragraph could also make a reference to the growing number of climate litigation cases, sometimes successful REF: Wewerinke-Singh, Margaretha, and Ashleigh McCoach. "The State of the Netherlands v Urgenda Foundation: Distilling best practice and lessons learnt for future rights-based climate litigation." <i>Review of European, Comparative & International Environmental Law</i> (2021).	We have added a sentence on climate litigation, but used another reference.	Government of France	Ministère de la Transition éco	France
49797	20	11	20	23	The role of Indigenous nations in the climate movement should be included here. The youth movement has linked their work to Indigenous rights and climate justice.	The role of indigenous people is already mentioned.	Chloe Hartley	Tsilei-Waututh Nation	Canada

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
77707	20	11	20	23	Arguably the most important trend in civil society action since AR5 is missing from this paragraph: the rise in anti-fossil fuel activism, including protests/resistance against new (and existing) fossil fuel infrastructure across the supply chain, from coalmines (e.g. Adani in Australia), fossil gas developments (e.g. fracking) and oil production through to mid-stream transportation facilities (e.g. Keystone XL pipeline, Dakota Access Pipeline, coal ports, LNG terminals) to refineries and to electricity generation facilities, as well as the financing of such activities (e.g. the divestment movement) and increasingly other professional services supporting such activities (e.g. Law Students for Climate Accountability boycotting law firms that act for fossil fuel companies; initiatives in the public relations and advertising sectors, etc.). See especially: Temper et al. (2020) 'Movements Shaping Climate Futures' in ERL; Cheon and Urpelainen's book 'Targeting Big Polluters' (2018); F. Green (2018) 'Anti-Fossil Fuel Norms' in 'Climatic Change'; Piggot (2018) 'The influence of social movements on policies that constrain fossil fuel supply' in 'Climate Policy', among others.	Accepted. We added a reference to anti-fossil fuel activism.	Fergus Green	Utrecht University	Netherlands
79893	20	11	20	23	One of the UNFCCC list of Priorities (ref. Patricia Espinosa) mentioned that no voice or solution is left behind, through re-engaging with observers and Non-Party Stakeholders in a unity of purpose. Non-state actor engagement in the UNFCCC process significantly increased since AR5, it would be interesting to review data on this and create projections.	Rejected. We cannot do this in this short paragraph.	Carlos Ruiz Garvia	UNFCCC	Panama
79959	20	11	20	23	Islamic Declaration on Climate Change UNFCCC	Accepted	Mairi Dupar	Overseas Development Institute	United Kingdom (of Great Britain and Northern Ireland)
79961	20	11	20	23	You have mentioned the Papal Encyclical but not the 2015 Islamic Declaration on climate change, which is hugely significant; see https://unfccc.int/news/islamic-declaration-on-climate-change ; and see analysis regarding the uptake of the Islamic Declaration here: https://cdkn.org/2015/08/opinion-islamic-climate-declaration-energise-muslim-communities-shared-cause/?loclang=en_gb	Accepted	Mairi Dupar	Overseas Development Institute	United Kingdom (of Great Britain and Northern Ireland)
45411	20	15	20	23	The role of the Fridays For Future youth movement on the aspect of increased societal pressure is not mentioned, while it has had tremendous impact in this respect, irrespective of whether one like such movements or not. This omission is particularly felt since details are provided on a specific moral leader (the Pope) - as well as the Yellow vest movement in the paragraph below, while the youth movement or other moral leaders are not specifically mentioned.	This is mentioned in the paragraph even if Fridays for Future is not mentioned by name.	Elena Verdolini	University of Brescia and Eur	Italy
82347	20	15	20	18	as another example beside the encyclical of Pope Francis from another religion the book of Fazlun M Khalid: Signs on the Earth - Islam, Modernity and the Climate Crisis, 2019 (includes in the appendix the "Islamic Declaration on Global Climate Change" of 2015 (in the pre-text of the Paris Agreement) could be mentioned	We have added the Islamic Declaration of Climate Change.	Amin Hasanein	Islamic Relief Deutschland	Germany
50867	20	18	20	20	Africa should also be listed here, next to Asia. There is an increased awareness of air pollution in Africa.	Accepted	Bianca Wernecke	South African Medical Research Council	South Africa
29527	20	20	20	20	No, the civil society climate movement didn't resurge - it was there all along, but it got more public and received media attention.	Accepted	Government of Norway	Norwegian Environment Agency	Norway
17181	20	24	20	34	The text emphasises resistance from society, implicitly suggesting that the public acceptance of stringent climate policies is a key ingredient to political action. But perhaps a more important source of resistance is the actions of interest groups that actively hinder climate policy, either directly, via lobbying and revolving doors, or indirectly, by shaping public discourses against policies. An abundant literature on the climate change countermovement documents these activities (Brulle 2018; Brulle 2019; Meng & Rode 2019). Literatures on the multi-level perspective (MLP, discussed e.g. in Ch5), policy sequencing (Meckling et al. 2017; Pahle et al. 2018), and the political economy of climate policy (Jakob et al. 2020; Dorband et al. 2020; Lamb & Minx 2020) further emphasize the importance of interest group opposition, the design of policies to counter them, and the need to strengthen institutions. I suggest to include interest group opposition as a "Social and Political Trend", since this fundamental threat to climate policy still exists, and indeed may worsen as countries and jurisdictions begin to take stronger actions.	Noted. The issue of interest groups or incumbent industries is already addressed in paragraph 119. In addition, public acceptance issue should be presented here as an opposite direction from "Civil societies pressure for stronger actions"	William Lamb	Mercator Research Institute	Germany
49785	20	24	20	34	The role of the Oil and Gas industry in lobbying against the introduction of strong climate policy must be identified as a factor in resistance. The Oil and Gas sector actively lobby against policy at the national, regional and local level. For example, municipalities in the U.S. have worked to develop policy such as building codes that support climate mitigation. With well funded lobbying campaigns, the oil and gas sector has successfully prevented these policies from being adopted or weakened the policies. In Canada, one recent example saw the oil and gas industry successfully lobby against the Clean Fuel Standards, resulting in the Government of Canada abandoning its commitment to develop regulated standards for the solid and gaseous fuel phases. Another larger example would be the Trans Mountain Pipeline Project that is being touted as part of the government's climate plan while facilitating oil extraction.	Noted. The issue of interest groups or incumbent industries is already addressed in paragraph 119. In addition, public acceptance issue should be presented here as an opposite direction from "Civil societies pressure for stronger actions"	Chloe Hartley	Tsleil-Waututh Nation	Canada
77709	20	24	20	34	It is striking that in a paragraph on "resistance" to climate policies no mention is made of resistance by business corporations, industry groups and economic elites to climate policies. This is discussed better (though still inadequately) in section 1.5.5, and some of the material from that section could be brought up to the section on "resistance" in page 20. It may in fact be preferable to add a separate paragraph, distinguishing social resistance from corporate "obstruction" (see further my below comment on section 1.5.5).	Noted. The issue of interest groups or incumbent industries is already addressed in paragraph 119. In addition, public acceptance issue should be presented here as an opposite direction from "Civil societies pressure for stronger actions"	Fergus Green	Utrecht University	Netherlands
86413	20	24	20	28	Upon quick review and several keyword searches, it looks to me that the cited source (Johannes Urpelainen & Thijs Van de Graaf 2018, "United States non-cooperation and the Paris agreement") does NOT discuss or mention the issue of "Just Transition".	Reference to Urpelainen and Van de Graaf 2018 is dropped.	Lorenzo Campus	Ca' Foscari University of Venice	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
86415	20	24	20	28	I believe the term "Just Transition" should be referred to in relation to a definition – both of the term and of the issue – which has not been clearly defined at this stage for the use within this Report – other than the mention of the COP 24 Just Transition Silesia Declaration on page 1-12, which is only one way of approaching it. "Just Transition" is a term mostly originated in political/union circles in developed countries and it does not – by default – represent an overall assessment of a comprehensively "just" or equitable transition effort, as climate impacts and climate risks are to be assessed over SPACE and TIME, including human livelihoods and economic activities in countries most affected by climate impacts today, particularly in the tropical regions, and human livelihoods and economic activities in future generations (if an appropriate and timely response to the climate crisis is not delivered), the count of which by far surpasses the count of supposedly affected citizens of developed countries where the "Just Transition" jargon originated. I believe the term "Just Transition" is worthy of a separate section providing a wide scope definition of the concept, which is missing. It should be referred to by this Report in line with the definition of Ethical frameworks given in this same Report at page 1-5: "Ethical frameworks are essential to choose policies to avoid negative distributional impacts across income groups, countries and generations." Therefore, I also believe that the reference to the "yellow vest" movement hardly qualifies (if not marginally) to be in relation with a Just Transition under this broader definition and considerations.	Noted. We have added more references after the sentence where "just transition" is mentioned. However, we do have a discussion of this concept several places in this chapter, see for instance 1.8.2.	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
48613	20	25	20	26	Suggest adding to reference Edouard Morena, Dunja Krause and Dimitris Stevis (eds) Just Transitions: Social Justice in the Shift Towards a Low-Carbon World, Pluto Press, 2020	We have added it to the reference	Lorraine Elliott	The Australian National University	Australia
72423	20	26	20	28	The reference to Lianos (2019) is not the most appropriate one as it is an Editorial view, i.e. likely not peer-reviewed. I can suggest: Martin M. and Islar M.(2020) The 'end of the world' vs. the 'end of the month': understanding social resistance to sustainability transition agendas, a lesson from the Yellow Vests in France. Sustainability Science, 10.1007/s11625-020-00877-9 as a more adapted reference	We have added it to the reference	Sylvain Pichat	University of Lyon, Ecole normale	Germany
72425	20	26	20	28	I do agree that "the yellow jacket movement [...] was triggered by higher fuel cost as a result of CO2 tax" however it was also triggered because it affected more a rural and far-from-cities population fraction of the population that cannot afford to live close to or in the main city where they work (e.g. Martin & Islar, 2020, 10.1007/s11625-020-00877-9). Thus an emphasis on the necessity of having fair compensating mechanisms should be mentioned here as well if a government wants to achieve the goal of GHG emission reduction.	Agree. This point is implicitly covered in "broader aspects of income inequality and other social issues" Due to volume constraints, we cannot write everything.	Sylvain Pichat	University of Lyon, Ecole normale	Germany
86263	20	26	20	28	The inequity of the carbon tax as it had been proposed in France is also discussed in Berry, "The distributional effects of a carbon tax and its impact on fuel poverty: A microsimulation study in the French context" Energy Policy, V 124, 2019 p 81-94.	Reference added	Sophie Szopa	LSCE	France
6879	20	28	20	33	Please provide evidence for these statements	We removed the sentence about South Africa.	Debra Roberts	EThekweni Municipality	South Africa
6881	20	29	20	33	It seems odd to make a statement with a global framing and then use an example only from the US to support it.	Noted European case has been added	Debra Roberts	EThekweni Municipality	South Africa
8955	20	29	20	31	This is a critical point, maybe it deserves more attention, emphasis and a better addressing.	Noted. We need to be short when we describe the trends.	Francesco Gonella	Ca' Foscari University of Venice	Italy
77175	20	29	20	33	In reporting the opposition to higher energy prices, a chance was missed, to include here a reflection on how such opposition – reflecting indeed the ethical principle of energy affordability – should be collected in shaping policies that not only look to combatting climate change, but also to securing equal rights of access to energy for all social classes.	Noted	Giacomo Grasso	ENEA	Italy
4191	20	30	20	30	ability and willingness' would be more fair; in absence of ability, we know nothing about willingness	Done	Marcel Wissenburg	Radboud University Nijmegen	Netherlands
14445	20	31	20	34	Please check referencing. The 71% figure is not referenced, but perhaps this is from EPIC et al, 2019, which is referenced in the next sentence? The 71% statistic requires a clear source.	Done	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
25083	20	31	20	34	The reference about the American survey would not be a great example to present the steep global carbon prices. Might be good to unpack a little	Noted. Reference to "European Attitudes to Climate Change will be added	Minal Pathak	WGIII TSU, Ahmedabad University	India
61155	20	31	20	33	More evidence in support of this claim for: 1) European countries: Poortinga, W., Fisher, S., Böhm, G., Steg, L., Whitmarsh, L., and Ogunbode, C. (2018). European Attitudes to Climate Change and Energy: Topline Results from Round 8 of the European Social Survey. Retrieved from http://www.europeansocialsurvey.org/docs/findings/ESS8_toplines_issue_9_climatechange.pdf 2) The UK: Phillips, D., Curtice, J., Phillips, M. and Perry, J. (Eds.) (2018). British Social Attitudes: The 35th Report, London: The National Centre for Social Research. Retrieved from http://bsa.natcen.ac.uk/media/39251/bsa35_climate_change.pdf . 3) Developed economies: Whitmarsh, L., Seyfang, G., and O'Neill, S. (2011). Public engagement with carbon and climate change: To what extent is the public 'carbon capable'? Global Environmental Change, 21, 56-65; Barasi, L. (2017). The Climate Majority: Apathy and Action in an age of Nationalism. Oxford. New International Publications Ltd.	Noted. Reference to "European Attitudes to Climate Change will be added	Steven R Smith	CES, University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
11103	20	35	20	40	Cross reference to Chapter 14	We already have a reference to chapter 14.	Anthony Patt	ETH Zürich	Switzerland
61595	20	38	20	39	A commitment to "100% renewable energy" is not something to recommend, as it can lead to suboptimal mitigation pathways and can even be counterproductive compared to a commitment to "100% low carbon energy" or "carbon net neutrality." A focus on "100% renewable energy" can lead to many net-negative outcomes such as relatively higher emissions (if, say, low carbon nuclear energy gets replaced with bioenergy), needlessly high energy costs and increasing energy poverty, higher land use and its negative impacts for ecosystems and biodiversity, and riskier, more expensive and slower path towards a low-carbon or carbon-neutral society. If 100% renewable targets and projects are mentioned at all, they should be mentioned with these caveats. Also, referred Jacobson 2020 and his line of research has been heavily criticized, see e.g., Clack et al., 2017, https://doi.org/10.1073/pnas.1610381114 .	Accepted. We deleted the sentence referring to Jacobson (2020).	Rauli Partanen	Think Atom	Finland
65635	20	38	20	39	"[...] and several cities and countries have committed to 100% renewable energy in their energy sectors (Jacobson 2020) [...]". Provide the original references for the claimed commitments and remove the citation to Jacobson 2020. The book by Jacobson continues along the line of research that has been widely criticized and rebutted (see, e.g., Bistline and Blanford, 2016, https://doi.org/10.1073/pnas.1603072113 ; Clack et al., 2017, https://doi.org/10.1073/pnas.1610381114). The IPCC should resort to credible references only in their assessment.	Accepted. See above.	Eero Hirvijoki	Aalto University	Finland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
12871	20	40	20	40	technology (chapter 16), amongst many others (chapters 13, 14).correct as Chapter 16 and Chapters 13, 14	Rejected. We do think this works as it is.	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
9833	20				Box 1.1 Fig 1 The figure is in a very low pixel quality. Some of the letter are in bold mode, while the others aren't. It should be changed with a higher resolution figure too.	Addressed in final	Government of Indonesia	Ministry of Environment and	Indonesia
51921	21	1	21	1	This section would flow better if 1.3.5 and 1.3.6 are their own separate section from 1.3.1 through 1.3.4. 1.3 talks about previous assessments, recent developments and evolving context, and the approach to assessment. Another way to think about the flow is past knowledge, changing context, and then the overall approach taken.	Thank you for this comment, following your suggestion and that of other reviewers the section is now a separate one (Section 1.5 in the new version) and the structure of the overall chapter has been modified to be more coherent.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
80361	21	1	22	30	It would be very important and useful that Section 1.3.5 explains what IP do and don't in relation to projected impacts. From this section, it does not emerge if and how the various IP differ along dimension that are critical for policy makers and businesses to make decisions, i.e. the impact of climate change. The goal to presents IPs in a neutral way, should be balanced with the need not hide that they present different levels of risks (across several types of risks). It should be mentioned, at least as an example, the risks highlighted by WGII in a 4C pathway in terms of well-being and social unrest and conflicts.	The IPs have not been designed to explore different climate impacts. For climate impacts, the reader is referred to Chapter 3 and WGII.	Stefano Battiston	University of Zurich	Switzerland
80363	21	1	22	30	It would be very important and useful that Section 1.3.5 explains that all the IP assume some form of CDR. There is no clarity in the public about this. It is important to clarify the following: i) if the CDR technologies that are assumed to have a role in the IP exist already, if not, what is the gap and what is the confidence level in the assumption ii) if the CDR technologies assumed in the model could have adverse environmental impact. Is there a scientific consensus on their safety? Which ones could be problematic?	The IPs illustrate different strategies in achieving the Paris goals. These strategies provide more or less emphasis on specific options, but in most cases, each option is part of the overall mix. For a detailed discussion on CDR and the consequences of land-use related CDR options, the reader is referred to the Chapter on land use - as the discussion is based on the literature in general, and not only the IPs.	Stefano Battiston	University of Zurich	Switzerland
80365	21	1	22	30	It would very important and useful that Section 1.3.5 explains what IP do and don't in relation to projected impacts. From this section, it does not emerge if and how the various IP differ along dimension that are critical for policy makers and businesses to make decisions. The goal to present IP in a neutral way, should not hide that they present different risks (across several types of risks). It should be mentioned, at least as an example, the risks highlighted by WGII in a 4C pathway in terms of well-being, social unrest and conflicts.	The IPs have not been designed to explore different climate impacts. For climate impacts, the reader is referred to Chapter 3 and WGII. For a detailed description of the link between IPs and scenarios explored in WGI please see chapter 3	Stefano Battiston	University of Zurich	Switzerland
80367	21	1	22	30	Section 1.3.5 should explain that IP do not contain a description of the financial system. This is an important limitation that needs to be acknowledged because as discussed in Chapter 15, the financial system cannot be assumed to be there to support the mitigation pathway. Unless the decision makers understand the risk of unmitigated climate change they will not adjust their risk perception across low/high carbon activities. And unless they understand the risk of a late and sudden transition they will postpone to reallocate capital when the others do it.	The IPs have not been designed to explore the financial system but the implications of various mitigation options to reach the Paris targets. For a discussion on the financial system the reader is referred to the relevant chapter.	Stefano Battiston	University of Zurich	Switzerland
6883	21	2	21	2	Deep uncertainty has not been defined in this Chapter. It is also not in the WGIII glossary. Please either define the concept or refer the reader to the WGII Cross-Chapter Box DEEP in Chapter 17	The beginning of this section (now 1.5) has been edited and the reference to deep uncertainty has been eliminated as it was not essential.	Debra Roberts	EThekweni Municipality	South Africa
10489	21	2	21	2	To which statements or informations does "implication" refer to? The whole section 1.3.4?	The beginning of this section (now 1.5) has been edited and the reference to the "implication" has been eliminated as it was not essential.	Philippe Waldteufel	CNRS	France
48615	21	2			Suggest sentence on whether/how scenarios and illustrative pathways address ethical questions of the kind introduced in the chapter (equity and fairness) including how these apply to people/s as well as countries;	The following statement has now been added at the beginning of what is now Section 1.5: Ethical and fairness frameworks considerations can then be used as a way of interpreting and translating into actions the maps of the future that scenarios unveil.	Lorraine Elliott	The Australian National Unive	Australia
50545	21	2	21	2	"The most obvious implication": implication of what? A precision would be helpful.	The beginning of this section (now 1.5) has been edited and the reference to the "implication" has been eliminated as it was not essential.	Anne Marie Treguier	CNRS	France
51923	21	2	21	2	"The most obvious implication" of what? Should not start a new section in this way. Rephrase	The beginning of this section (now 1.5) has been edited and the reference to the "implication" has been eliminated as it was not essential.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
54545	21	2	21	2	The most obvious implication of what? Something missing here. Deep uncertainty as a concept was mentioned earlier but without a formal definition. If it will be used here, the definition should either be summarized or the text should point back to a definition/glossary.	The beginning of this section (now 1.5) has been edited and the references to "implication" and "deep uncertainty" have been eliminated as not essential.	Government of United States of America	U.S. Department of State	United States of America
54547	21	2	21	3	"The most obvious implication is that the future holds deep uncertainties, and emissions will be substantially affected both by the choices we make, and wider developments." The most obvious implication of what? This is the first sentence of Section 1.3.5 and should be able to stand alone.	The beginning of this section (now 1.5) has been edited and the references to "implication" and "deep uncertainty" have been eliminated as not essential.	Government of United States of America	U.S. Department of State	United States of America
75917	21	2	21	3	This sentence is unclear. Implications of what?	The beginning of this section (now 1.5) has been edited and the references to "implication" and "deep uncertainty" have been eliminated as not essential.	Jan Fuglestedt	CICERO	Norway
5055	21	6	21	15	The entire paragraph seems redundant. This is not the Summary for Policy Makers, so readers either know what scenario modelling is for or may look it up. Recommendation: remove paragraph or shorten significantly.	This section, now 1.5, has been shortened	Lina Hollender	n/a	Germany
50617	21	6	21	15	Chapter 3 of WGIII SOD emphasizes the role of IAMs in building quantitative scenarios "The most comprehensive scenarios in the literature often comprise narratives (qualitative descriptions of how the future may unfold), which are then translated into quantitative pathways using IAMs (Riahi et al. 2017; O'Neill et al. 2020b; IPCC 2014)". Shouldn't IAMs be introduced earlier in this chapter?	Chapter 3 will mostly introduce IAMs and the AR6 database. The role of Chapter 1 is to introduce the multiple framework models and tools used in the report, among which IAMs.	Anne Marie Treguier	CNRS	France
50547	21	13	21	14	AR6 WG1, Chapter 1, section 1.6 describes the history of scenarios within the IPCC (1.6.1.3) and could be referenced here.	Now referenced in the section (now 1.5 in new version of Chapter)	Anne Marie Treguier	CNRS	France
12873	21	14	21	14	(Nakicenovic, & Swart remove comma. (Nakicenovic& Swart	Done, thank you	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
75919	21	14	21	15	This sentence starts with a AR6 perspective (i.e. not WGIII specific) and needs references to a broader part of the literature; i.e. some from the physical aspects. One recent relevant paper is Tebaldi et al in ESD: https://doi.org/10.5194/esd-12-253-2021	In the section, now 1.5, we now refer directly to WGI for full consistency, thank you.	Jan Fuglestedt	CICERO	Norway
45413	21	16	21	19	The sentence contains "including" twice, should probably be revised.	In what is now section 1.5 this has been corrected thank you.	Elena Verdolini	University of Brescia and Eur	Italy
50549	21	16	21	19	Do you mean that some quantitative scenarios include narratives? Perhaps references could be added here, or more precise information coming from chapter 3 or annex C.	The paragraph has now been changed and reads: This assessment draws upon a wide range of qualitative and quantitative scenarios including quantitative scenarios developed through a wide and heterogeneous set of models ranging from spreadsheets to complex computational models (Chapter 3, Annex C provides further discussion and examples of computational models).	Anne Marie Treguier	CNRS	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
50631	21	16	21	21	Some numbers would be helpful here: how many scenarios, how many contributors... annex C is very detailed: is this level of detailed information on methods and scenarios something new in AR6 that should be emphasized? Or was the documentation of scenarios already very extensive in AR5?	The Box on the Ips will introduce them in detail. All the information about AR6 database will be contained in Chapter 3	Anne Marie Treguier	CNRS	France
69955	21	20			The expression "Chapter 3, Annex C" is confusing, one may look for an Annex C to Chapter 3, while it is an Annex to the whole volume.	Thank you, modified	Cédric PHILIBERT	Institut Français des Relations	France
50551	21	25	21	27	It is unclear to me what is meant by "individual chapters can bundle scenarios". Does this mean that the use of scenarios is not homogeneous across WGIII chapters?	The text was confusing, now amended to "The concept of an illustrative pathway (IP) was introduced in IPCC Special Report on 1.5 (IPCC 2018a) to highlight a small number of quantitative scenarios with specific characteristics, drawn from a larger pool. IPs are chosen to represent a key story, an emblematic feature or trade of emerging from the wider set decarbonisation pathways."	Anne Marie Treguier	CNRS	France
75921	21	25	21	27	I suggest you mention "addressing sectors", and not only "chapters".	The text was confusing, now amended to "The concept of an illustrative pathway (IP) was introduced in IPCC Special Report on 1.5 (IPCC 2018a) to highlight a small number of quantitative scenarios with specific characteristics, drawn from a larger pool. IPs are chosen to represent a key story, an emblematic feature or trade of emerging from the wider set decarbonisation pathways."	Jan Fuglestedt	CICERO	Norway
43743	21	29			It would be helpful to provide more background on the rationale for the new set of pathways. The high number of illustrative pathways is not helpful and seems to reduce their meaningfulness. The inclusion of the NBZ pathways which are not compatible with Article 4 of the Paris agreement along with other 1.5 and 2° pathways is actually quite disturbing. The large amounts of required negative emissions to compensate for large residual fossil fuel CO2 emissions need to be put in perspective. We recommend to drop the NBZ pathways entirely, or at least show them separately.	The IPs illustrate the consequences of different mitigation strategies in terms of ambition and the mix of different options. In order to simplify the overall set-up and reduce the emphasis of negative emissions the NBZ pathways have been dropped.	Government of Jamaica	Meteorological Service Division	Jamaica
45693	21	29	23	19	Please choose names for the IPs that are more systematic (always refer to the warming level) and self-explaining, in particular change "Sup" to "OS", analogous to NBZ reflecting that this is an overshoot pathway. "Focus on other supply side" in Box 1.1. Figure 1 sounds a bit odd, please modify. In addition, please explain why WG III did not choose IPs that are consistent with the CMIP6 projections assessed by WG I, since this would have been most useful.	The reason for choosing the IPs is to illustrate the consequences of different mitigation strategies and highlight the role of key options in meeting the Paris Target. This cannot be done with the WG1 scenarios. Still, in terms of temperature outcomes the IPs and WG1 scenarios are to some degree aligned. A better description of this link is provided into Chapter 3. The naming of the Illustrative Mitigation Scenarios was led from Chapter 3, we merely report these	Government of Germany	Federal Ministry for the Environment	Germany
61597	21	29	23	19	Box 1.1. None of the illustrative pathways, according to Chapter 3, lead to an energy system where nuclear has a significant role – even though it's the only proven technology besides geographically limited hydro and geothermal that has managed to decarbonize power systems of whole nations both rapidly and affordably (France, Sweden, Switzerland etc), yet both CCS and BECCS plays a major role. Why is much more speculative technologies included as major components, but proven technologies are all but ignored? Are the IPCC authors biased against nuclear? If a climate tool such as nuclear is seen by some as being unpopular, it's not the job of IPCC to reinforce this in their reports and mitigation pathways, but to work to mitigate these issues so as to facilitate a climate mitigation effort of maximum effectiveness (ie. technologically neutral). See how the national projects could be scaled to global scale from Qvist and Brook https://doi.org/10.1371/journal.pone.0124074 .	The IPs reflect the scientific literature. In the literature, renewables, efficiency and CDR have a prominent role. Most of the literature suggests that the role for nuclear power is more modest and can, if necessary, be also replaced by other options. Still, please note that most IPs show a role for nuclear power - and that detailed conclusions on different options do not come from the IPs, but in the case of nuclear power from the energy supply chapter.	Rauli Partanen	Think Atom	Finland
65637	21	29	23	19	Box 1.1. None of the illustrative pathways, according to Chapter 3, lead to an energy system where nuclear would have a non-negligible role, yet CCS and BECCS do play a major role. How is it possible that a mature, scalable technology is not seen to have any role while a hypothetical method that is yet to be demonstrated at relevant scales is given so much emphasis? This seems rather illogical given that Figure SPM.9 estimates the hypothetical combined potential of CCS and BECCS to be at most comparable to that of nuclear yet more expensive. Please justify why there exists not a single Illustrated Pathway scenario that would explore the possibilities of deploying nuclear energy in large scale while both <2-Ren and 1.5-Ren scenarios are mentioned to enjoy artificial, enhanced market diffusion to explore a high-share renewable scenarios.	The IPs reflect the scientific literature. In the literature, renewables, efficiency and CDR have a prominent role. Most of the literature suggests that the role for nuclear power is more modest and can, if necessary, be also replaced by other options. Still, please note that most IPs show a role for nuclear power - and that detailed conclusions on different options do not come from the IPs, but in the case of nuclear power from the energy supply chapter.	Eero Hirvijoki	Aalto University	Finland
50615	21	35	21	35	The AR6 scenario database seems to be mentioned only once here in chapter 1. Is it something that should be introduced in more detail in chapter 1?	AR6 is introduced in detail in Chapter 3	Anne Marie Treguier	CNRS	France
45415	21	38	21	40	I would suggest to offer a reference in the text for people to refer to if they want to understand what an SSP is. I do not recall finding it before this point in the chapter, I may be wrong. Many non-experts may not know what as SSP2 is.	Thank you, we have now changed the text to: "All but one of these draws upon the wider socio-economic background of Shared Socioeconomic Pathway SSP2, defined as "Middle of the Road", as it assumes that the world follows a path in which social, economic, and technological trends do not shift markedly from historical patterns."	Elena Verdolini	University of Brescia and European Commission	Italy
70251	21	38	21	41	The box needs to explain why SSP1 & 2 are the only SSPs chosen. Is this out of convenience? Is it a judgement that only these scenarios are compatible with successful climate action? Are the authors therefore implying that certain socio-economic and demographic conditions are necessary for low warming outcomes?	Only a limited number of IPs could be selected. As the emphasis was on different mitigation strategies, the role of different baselines is not highlighted in the IPs. Still, socio-economic development is an important factor in mitigation - and other parts of the report therefore show the impact of different SSPs.	Philippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
75923	21	38	21	41	It would be very useful if you can say more why you mainly use SSP2 (i.e., keeping the some background conditions constant and explore some specific dimensions etc. This has been well explained at various stakeholder meetings, and would be very useful here)	Only a limited number of IPs could be selected. As the emphasis was on different mitigation strategies, the role of different baselines is not highlighted in the IPs. Still, socio-economic development is an important factor in mitigation - and other parts of the report therefore show the impact of different SSPs.	Jan Fuglestedt	CICERO	Norway
78273	21	38	21	41	Further discussion is needed on how to present 11 IPs - it's a large number of scenarios.	The number of Ips has been decreased.	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
50553	21	39	21	39	Some historical perspective on SSPs, and a reference and/or a pointer to the relevant section of chapter 3, should be given here because it is the first time SSPs are mentioned in this chapter. Perhaps mention that SSPs have been used to define the physical climate projections assessed in WGI? (see WGI chapter 1, section 1.6).	A reference to SSP has been added.	Anne Marie Treguier	CNRS	France
12875	21	41	21	41	in (chapter 3). Write Chapter	Thank you	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
12877	21	42	21	42	A current-policies (circa 2018) IP correct as Circa capita C	Thank you	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
50555	21	42	21	45	Is there a way to "label" the IPs with a level of radiative forcing (W/m2) in 2100, as done for the SSPs in WGI, for example: "SSP2-4.5" for 4.5 W/m2 (see WGI chapter 1, section 1.6)? This would increase the consistency across WGs in AR6. Where does the average temperature change in 2100 come from? This temperature change seems large, it does not seem in line with WGI, chapter 4.	The main emphasis is on the mitigation strategy, the link with the radiative forcing and the WGI scenarios is going to be presented in Chapter 3.	Anne Marie Treguier	CNRS	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
80359	21	42	21	44	There is only one IP leading to 4C and 9 IP leading in various ways to 2C. Depending on how these IP are presented, this grouping could give policy makers the impression that it is likely to reach 2C. However, it could be argued that the moment this is not likely at all, and that it is the case precisely because there is not clarity among policy makers and businesses on the problems that arise in case of not meeting the 2C target.	The IPs show different pathways in meeting the internationally agreed upon Paris goals. They do not directly answer the question of feasibility. Independent of this, please note that an important conclusion of the assessment as a whole is that it is still possible to meet the Paris goals.	Stefano Battiston	University of Zurich	Switzerland
51925	22	13	22	14	Change "illustrates that both climate and other SDGs can be simultaneously achieved" to "illustrates a future where both climate and other SDGs are simultaneously achieved"	Done thank you	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
8957	22	15	23	1	Both Fig. 1 and Table 1 in the Box 1.1 are rather obscure and poorly descriptive. Figures should not be a comment of the text, but viceversa.	The box is an object in a document that contains information that is supplemental to the main text. In this case the box is intended to be a cross-chapter box and be a stand-alone entity.	Francesco Gonella	Ca' Foscari University of Venice	Italy
4349	22	18	22	18	Fig. 1.1 Add contents on Assumptions and other Attributes' compounding effect	Illustrative Pathways are developed in detail in Chapter 3. This is where the assumptions and attributes are to be found.	Alka Bharat	Maulana Azad National Institute of Technology	India
15449	22	18	22	19	Box1.1 Table 1 at row of NBZ: Is CCS included in NBZ or Sup as shown in Box1.1 Figure 1?	The NBZ scenario is now dropped. CCS is included in the SUP scenario. Details about the IPs are found in Chapter 3.	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan
51927	23	2	23	2	Change "the IPs are, as their name implies are" to "the IPs, as their name implies, are"	changed as suggested	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
75925	23	2	23	10	Very good that you also address what the IPs don't do. Make even more clear that these are not recommendations, not most likely, not predictions.	Good comment. Recommendations accepted and the suggested text added accordingly.	Jan Fuglestad	CICERO	Norway
75927	23	2	23	10	I think you could split the section here to one on what they don't do and one on relation to WGI scenarios (as well as WGII scenarios)	Given that the relationship to IPCC WG1 is limited to less than one line of text, it probably doesn't deserve a separate section. No change made.	Jan Fuglestad	CICERO	Norway
75929	23	2	23	10	On relation to WGI scenarios: Please contact WGI authors for a closer check about how IPs align with the WGI core set. SyR authors Malte Meinshausen and Chris Jones may help. I am also happy to help on this.	Done. We have decided to drop the sentence describing the overlap between WG1 and WG3 scenarios.	Jan Fuglestad	CICERO	Norway
48617	23	5	23	6	If IP cannot address equity and fairness themes, then include specific statement here - observation on alternative socio-economic pathways is not sufficient to capture this limitation	Good suggestion. Text has been added to indicate that only IP 1.5-SP gives priority to the full range of sustainable development goals.	Lorraine Elliott	The Australian National University	Australia
78275	23	7	23	10	The discussion of the framing can be distanced from the Paris goals. BAU, pledges and two levels of mitigation ambition defined by warming levels.	Good suggestion. Text has been changed to indicate that IPs are framed in terms of BAU, pledges and two levels of mitigation ambition defined by warming levels.	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
22717	23	9	23	9	We recommend to replace the term "Energy chapter" with "Chapter 6"	The sentence has been reworded to remove the reference to the Energy chapter.	Government of France	Ministère de la Transition écologique	France
70253	23	9		10	Why do the IPs only overlap with one IPCC WG1 scenario? This needs elaboration	We have decided to drop the sentence describing the overlap between WG1 and WG3 scenarios. The topic is covered in Chapter 3.	Philippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
75931	23	9	23	9	Please add "directly" before "overlap" (in addition to other changes that may come from contact with WGI)	Thanks. The change has been made as recommended.	Jan Fuglestad	CICERO	Norway
50557	23	10	23	10	Which IP does SSP2-4.5 correspond to? Looking at the emission curves for the different SSPs in WGI chapter 1 section 1.6 (figure 1.33) I don't find a strong similarity with any IP (considering the emission curves in WGII, chapter 3, figure 3.6).	Thanks. We have clarified as follows: "Finally, they only overlap with the scenarios employed by IPCC WG1 in one instance— ModAct."	Anne Marie Treguier	CNRS	France
51929	23	10	23	10	SSP2-4.5. not clear which of the 11 IPs overlaps with WG1. And clarify if what meant here is SSP2-RCP4.5	Thanks. We have decided to drop the sentence describing the overlap between WG1 and WG3 scenarios. The topic is covered in Chapter 3.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
22719	23	11	23	13	The sentence is not complete: "Scenario development in support of a broad spectrum of issues and in support of a wide range of decision makers as was demonstrated at the 2019 scenarios workshop (O'Neill et al. 2019)."	Thanks. We have changed the text to read: "Other scenarios have been developed in support of a broad spectrum of issues and in support of a wide range of decision makers as was demonstrated at the 2019 scenarios workshop (O'Neill et al. 2019)."	Government of France	Ministère de la Transition écologique	France
51931	23	11	23	13	incomplete sentence	Thanks. We have changed the text to read: "Other scenarios have been developed in support of a broad spectrum of issues and in support of a wide range of decision makers as was demonstrated at the 2019 scenarios workshop (O'Neill et al. 2019)."	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
51933	23	11	23	19	This paragraph seems less relevant to the focus of the box. Replace with another paragraph that explains where the 11 IPs came from (the 1600 scenarios).	Thanks. We have a statement describing the scenarios' origins: "The quantitative versions, selected from the scenario database, provide numerical values that are internally consistent and can be associated directly with specific human activities (e.g. passenger transport, commercial building use, power generation, or refining)." We think that a comment of the many other scenarios is helpful and have chosen to retain it.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
78741	23	11	23	19	what's about scenarios for very high shares of renewables? The 100% renewables community is for sure distinct to the IAM/IPCC world, but raises increasingly attention. Hansen et al. (https://www.sciencedirect.com/science/article/pii/S0360544219304967) has provided some overview on this community, while Jaxa-Rozen (https://www.nature.com/articles/s41558-021-00998-8) has shown that the IAM community seems to have a negative bias against solar energy, which is not the case in non-IAM communities. Such aspects shall be integrated in this part. This is further supported by most recent findings of Victoria et al. ((2021), Solar photovoltaics is ready to power a sustainable future, Joule, in press)	Thanks. The Ren scenarios reflect high shares of renewables. We describe them as follows: "Enhanced development and rapid diffusion of renewables make a dominant contribution to decarbonisation."	Christian Breyer	LUT University	Finland
20049	23	13	23	14	See: - Nerini, F. F., Sovacool, B., Hughes, N., Cozzi, L., Cosgrave, E., Howells, M., ... & Milligan, B. (2019). Connecting climate action with other Sustainable Development Goals. Nature Sustainability, 2(8), 674-680. - Van Soest, H. L., Van Vuuren, D. P., Hilaire, J., Minx, J. C., Harmsen, M. J., Krey, V., ... & Luderer, G. (2019). Analysing interactions among sustainable development goals with integrated assessment models. Global Transitions, 1, 210-225.	Thanks for the additional references.	Haris Doukas	National Technical University of Athens	Greece
20051	23	14	23	16	See: - Forouli, A., Nikas, A., Van de Ven, D. J., Sampedro, J., & Doukas, H. (2020). A multiple-uncertainty analysis framework for integrated assessment modelling of several sustainable development goals. Environmental Modelling & Software, 131, 104795. - Van de Ven, D. J., Sampedro, J., Johnson, F. X., Bailis, R., Forouli, A., Nikas, A., ... & Doukas, H. (2019). Integrated policy assessment and optimisation over multiple sustainable development goals in Eastern Africa. Environmental Research Letters, 14(9), 094001.	Thanks for the additional references.	Haris Doukas	National Technical University of Athens	Greece

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
20137	23	14	23	16	See also: - Van de Ven, D. J., Sampedro, J., Johnson, F. X., Bailis, R., Forouli, A., Nikas, A., ... & Doukas, H. (2019). Integrated policy assessment and optimisation over multiple sustainable development goals in Eastern Africa. <i>Environmental Research Letters</i> , 14(9), 094001. - Forouli, A., Nikas, A., Van de Ven, D. J., Sampedro, J., & Doukas, H. (2020). A multiple-uncertainty analysis framework for integrated assessment modelling of several sustainable development goals. <i>Environmental Modelling & Software</i> , 131, 104795. - Zhou, W., McCollum, D. L., Fricko, O., Fujimori, S., Gidden, M., Guo, F., ... & Zhou, Y. (2020). Decarbonization pathways and energy investment needs for developing Asia in line with 'well below 2° C. <i>Climate Policy</i> , 20(2), 234-245. - Dagnachew, A. G., Hof, A. F., Lucas, P. L., & van Vuuren, D. P. (2020). Scenario analysis for promoting clean cooking in Sub-Saharan Africa: Costs and benefits. <i>Energy</i> , 192, 116641. - Nerini, F. F., Sovacool, B., Hughes, N., Cozzi, L., Cosgrave, E., Howells, M., ... & Milligan, B. (2019). Connecting climate action with other Sustainable Development Goals. <i>Nature Sustainability</i> , 2(8), 674-680. - Van Soest, H. L., Van Vuuren, D. P., Hilaire, J., Minx, J. C., Harmsen, M. J., Krey, V., ... & Luderer, G. (2019). Analysing interactions among sustainable development goals with integrated assessment models. <i>Global Transitions</i> , 1, 210-225.	Thanks for the additional references.	Nikas Alexandros	National Technical University	Greece
80897	23	18	23	19	"scenario users ... have appeared as scenario consumers" seems to be redundant.	Text has been changed as suggested.	Heinz Wittenbrink	FH Joanneum University of A	Austria
54549	23	22	23	27	Need some transition from the previous section. For example, will each of the IPs be evaluated according to these dimensions?	This section has now been moved at the very end of Chapter, now section 1.8 and there is a new transition paragraph, reading "The issues sketched in this chapter underline the multi-dimensional nature of the mitigation challenge."	Government of United States of America	U.S. Department of State	United States of America
70255	23	25		27	The description of BAU is far too tidy. It reads like it's an actual choice (some kind of rational analysis of the costs, risks and rewards of action and inaction). It is at least some kind of market failure (to state it in economist terms). There needs to be reference to the real possibility of catastrophic collapse under BAU development.	The statement, now in section 1.8, reads as follows: "Continuing 'business as usual' is still a choice, that if inaction, which in addition to the obvious geophysical risks, involves not making best use of new technologies, risks of future stranded assets, and greater local pollution, and multiple other environmental threats"	Philippe Tulkens	European Union (EU) - DG Re	Belgium
22721	23	28	23	29	In the sentence "Building on frameworks ... of both desirability and feasibility", we suggest to precise assessment of what.	The phrase, now in section 1.8, reads "dimensions of feasibility assessment"	Government of France	Ministère de la Transition é	France
10491	23	29	23	32	There is something wrong with this sentence	The phrase has been erased	Philippe Waldteufel	CNRS	France
20053	23	29	23	31	To underpin: -Nikas, A., Lieu, J., Sorman, A., Gambhir, A., Turhan, E., Baptista, B. V., & Doukas, H. (2020). The desirability of transitions in demand: Incorporating behavioural and societal transformations into energy modelling. <i>Energy Research & Social Science</i> , 70, 101780.	Incorporated, in 1.7.4	Haris Doukas	National Technical University	Greece
80899	23	31	23	31	The "explores" at the end of the line seems to have no subject.	The phrase has been erased	Heinz Wittenbrink	FH Joanneum University of A	Austria
80901	23	39	23	39	"and" instead of the comma between "choices" and "enabling" (?)	added thank you	Heinz Wittenbrink	FH Joanneum University of A	Austria
79905	24	1	24	10	Figure 1.4 There is no adequate link with institutional requirements. Further, suggest to add data/information related to "Just Transition" scenarios in this particular figure.	Figure 1.4 (now Fig 1.8) mentions institutional requirements as a factor and this is elaborated in other parts of the chapter.	Carlos Ruiz Garvia	UNFCCC	Panama
4351	24	2	24	4	Fig. 1.4, match the scale and level from column 1 - 3, make it specific and give scope for national subjectivity	Figure 1.4 (now figure 1.8) is not generated originally by the chapter team and we are not therefore able to alter it along the lines suggested here.	Alka Bharat	Maulana Azad National Instit	India
15451	24	2	24	3	What do the symbols located between each column something like curly brackets mean?	Attempted to show alignments	Hiroaki Kondo	National Institute of Advance	Japan
25087	24	2	24	5	Another integrative element is the SDG linkages. Do you think this figure could include one last column on SDGs	Unfortunately don't see how this could work	Minal Pathak	WGIII TSU, Ahmedabad Unive	India
45417	24	2	24	4	All dimensions listed in figure 1.4 are indicated with adjectives, expect the "technology and infrastructure". For consistency, said dimension could be named "technological - including infrastructure"	Thanks, addressed	Elena Verdolini	University of Brescia and Eur	Italy
45419	24	2	24	3	In Figure 1.4, I do not understand the reference to chapter 4 in the box with the wording "enabling conditions". In the context of the UNFCCC technology and finance are also considered "enabling conditions". Perhaps Chapter 15 and 16 should also be referenced in the box? Similarly, the box "policy and international assessment" does not include reference to chapter 16, which has a whole section on innovation policies. But perhaps I am misunderstanding the goal here.	I realise its maybe prone to misunderstanding. Building on SR1.5, Chapter 4 lists these five as Enabling Conditions.	Elena Verdolini	University of Brescia and Eur	Italy
75933	24	3	24	3	I think "emissions" is missing in the upper right blue box.	Thank you. Edited	Jan Fuglestedt	CICERO	Norway
6885	24	4	24	4	In Figure 1.4, all but two dimensions are presented in terms of their feasibility in the required transition. Why are the environmental and financial dimensions presented as impacts and costs? Why not consider issues such as the potential of NBS, ecosystem systems services, available finances? It seems logical to frame all the dimensions in the positive rather than some in the positive and others in the negative.	Thanks, addressed	Debra Roberts	EThekwini Municipality	South Africa
4353	24	21	24	21	Add Resilience of Systems	The section (now moved) does discuss resilience	Alka Bharat	Maulana Azad National Instit	India
4713	24	21	24	21	The Lancet Countdown planetary health literature deserves to be covered here (see several articles by Watts et al).	The statement is simply intended to highlight a connection between climate pollution and human and planetary health. There is no need to cover all the health issues in detail. Thank you	Julia Steinberger	University of Lausanne	Switzerland
8959	24	21	25	42	Section 1.4 correctly addresses the tension between growth and sustainability, but in the end the assumption that development (mostly intended as economic growth) should be the primary need pervades the document. Given also the increasing scientific school of thought that decoupling is not going to be feasible, this represents a major epistemological flaw of the document. Moreover, no hint is made about the link with the ecological emergency (sixth mass extinction, etc.).	We do not agree that the section's summary is that development mostly as economic growth is or should be the primary need. The section attempts to give coverage to all the key arguments in the literature including those that criticise development as economic growth.	Francesco Gonella	Ca' Foscari University of Ven	Italy
50583	24	21	32	29	Section 1.4 lacks references to other chapters. Where are the concepts presented here used in the report? Where and how is the relation between SDGs and climate mitigation taken into account in the chapters?	References of other chapters have been added	Anne Marie Treguier	CNRS	France
54551	24	21	24	22	What is the purpose of this section? Is this WGIII report going to discuss SDGs in each chapter? If so, is a consistent approach going to be used? How does this section relate to or build upon Section 1.3?	The section supports the finding that climate change is connected with the broader concept of development and that this connection has far reaching implication for climate policy. Other chapters discuss this connection and mentions other SDGs	Government of United States of America	U.S. Department of State	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
70257	24	21	32	29	General comment Section 1.4 (sustainable development pathways). The general concept of development pathways is mentioned in the SPM and in Chapter 4. This is a welcome recognition of the principle that climate and sd agendas should go hand-in-hand. However, this section is excessively long and theoretical. It should instead concentrate on referring to the main SD sections of the report and answer some basic questions that the reader needs to know (perhaps even in FAQ style). 1) what is a "development pathway"? In particular, it seems like a development pathway is simply 'the way things are going' in a given country. This is quite a different concept from emissions pathways, which tend to be driven by scenario assumptions or temperature/forcing outcomes. Therefore the two should not be confused. The casual reader might assume that a development pathway is a mitigation pathway that incorporates development needs, yet it appears this is not a correct assumption. 2) Are there any examples of low emission sustainable development pathways in this report (if so, where) or is the term just used to recognise that mitigation should not be pursued too narrowly? ; 3) are the report's main mitigation pathways (those in Fig SPM.6) also sustainable development pathways? or if not, has the report determined whether and how they can be pursued in a sustainable-development friendly manner?	The section has been edited to make it sharper. Links to other chapters have also been provided.	Philippe Tulkens	European Union (EU) - DG Re	Belgium
72429	24	21	25	42	This introductory section to 1.4 tends to repeat itself. It could be more synthetic and straight to the point(S)	The section has been edited to make it sharper	Sylvain Pichat	University of Lyon, Ecole nor	Germany
4355	24	22	25	42	Add reference : Bharat A, Chandan C (1997/ 2001), Urban governance for sustainable Development CAP Newsletter Vol. 9, June 03 page 13, www.commonwealth-planners.org_Governance_For_Sustainable_Development.pdf (ResearchGate)	Rejected as this is not recent literature and does not add much to the argument.	Alka Bharat	Maulana Azad National Instit	India
4357	24	22	25	42	Add Reference :Bharat A, Sharma D (2009), Vertical planning in urban development and climate change, Journal of the Indian Institute of Architects, Jan.09, Vol. 74 issue 01, Page no. 24- 28 ,ISSN 0019 – 4913	Rejected as this is not recent literature and does not add much to the argument.	Alka Bharat	Maulana Azad National Instit	India
4359	24	22	25	42	Add Reference: Nair Rekha .S ,Bharat A, Manu G. Nair (2012), DPIRS Framework for sustainable development of coastal areas, Bonfring International Journal of Industrial Engineering & Management science, Vol. 2 , ,no.4 , 2012 , pp 117 – 124, ISSN (Online):2277-5056 ISSN (Print):2250-1096	Rejected as this is not recent literature and does not add much to the argument.	Alka Bharat	Maulana Azad National Instit	India
4361	24	22	25	42	Add reference : Sharma S , Bharat A, DasV.M (2013), Statistical change detection in water cycle over two decades and assessment of impact of urbanization on surface and sub-surface water flows, Open journal of modern hydrology , scientific research publishing, 7th Oct. 2013, ISSN (print) 2163 – 0461, ISSN (online) 2163 – 0496	Rejected as this is not recent literature and does not add much to the argument.	Alka Bharat	Maulana Azad National Instit	India
4363	24	22	25	42	Add refrence: Sharma S , Bharat A, DasV.M. (2013), Study of variations in urban and hydrological components in process of urbanization, International Journal of Engineering Research, Vol. No. 2 , issue no. 3 pp: 208 – 212 , July 2013, ISSN: 2319 – 6890	Rejected as this is not recent literature and does not add much to the argument.	Alka Bharat	Maulana Azad National Instit	India
51935	24	22	25	42	In many occasions in this section, climate change is used when it should have said climate change mitigation. See the first sentence for example. Similarly, the text jumps back and forth about whether it is climate change or climate change mitigation is being talked about in term of its connection to SDGs. Finally, in other places in the report including in this chapter (Section 1.4), it is stated that not all SDGs are compatible/synergistic with climate change mitigation and there are tradeoffs. This aspect should be reflected here as well.	The text has been edited. Climate mitigation has been used in a few places where this is intended but there are other places (such as the first sentence) where climate change is more accurate than climate mitigation. The section makes the point that there are synergies and trade offs between SDGs and climate mitigation.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
22723	24	28	24	28	the term 'a multiple stressor' seems unclear, and can be replaced by 'is a complex, multi-faceted stressor'.	Thank you. This text has been deleted.	Government of France	Ministère de la Transition éco	France
79963	24	28	25	2	Climate change also aggravates conflict, as documented in a review of more than 300 pieces of literature on conflict and climate change by Peters et al (2020), see: Climate, conflict and fragility, an evidence review. London: ODI. https://www.odi.org/publications/17015-climate-change-conflict-and-fragility-evidence-review-and-recommendations-research-and-action Please contact me for the full technical report associated with this review (the url links to the short 30 page version). Long technical report from: m.dupar@odi.org.uk	We have added conflict. The list of the impacts of climate change was not intended to be exhaustive	Mairi Dupar	Overseas Development Instit	United Kingdom (of Great Britain and Northern Ireland)
8217	24		24		Socio-cultural: Add inequality	The specific terminology for the Feasibility criteria as used in the Figure is as given from authors on that process. We state explicitly in introducing section 8 " *Socio-cultural, including particularly ethical and justice dimensions, and social and cultural norms;"	Frida Zahlander	DanChurchAid	Denmark
48619	24		24		Figure 1.4 recommend adding 'social justice' or 'equity and fairness' to cell for socio-cultural/feasibility assessment	The specific terminology for the Feasibility criteria as used in the Figure is as given from authors on that process. We state explicitly in introducing section 8 " *Socio-cultural, including particularly ethical and justice dimensions, and social and cultural norms;"	Lorraine Elliott	The Australian National Unive	Australia
82495	25	1	25	1	I am not so sure about the meaning of "weak institutions" here. Maybe elaborate on it a little bit or change the wording.	Well spotted. The sentence has been deleted	Fei Luo	VU Amsterdam	Netherlands
2981	25	2	25	3	Worth adding a comment re: poverty impacts occurring within industrialised and developing states.	This comments is not clear. The section has mentioned how climate change relates to poverty with specific examples.	Beth Edmondson	Federation University	Australia
6887	25	2	25	2	Is 'likely' as used here the IPCC calibrated likelihood range? If yes, please italicise. If no, please replace it with a synonym to avoid confusion.	The term has been replaced to avoid confusion. Thank you	Debra Roberts	EThekwini Municipality	South Africa
45725	25	2	25	5	To strengthen this point, please also refer to the definition of climate change as driving force/driver affecting natural and human systems (see UNEP GEO-6 SPM, p. 6-7, http://wedocs.unep.org/bitstream/handle/20.500.11822/27652/GEO6SPM_EN.pdf)	The concept of climate impact on natural system has been added to the text.	Government of Germany	Federal Ministry for the Envir	Germany
29529	25	3	25	5	This statement fails to capture the global distributional aspect that less developed countries need to attain economic growth, whereas richer countries cannot persist on today's emissions trajectory.	The global distributional aspect has been captured.	Government of Norway	Norwegian Environment Age	Norway
78277	25	3	25	6	Describing SD as being invented to resolve climate issues is just wrong!	The sentence has been removed.	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
4705	25	5	25	9	The fact that economic growth drives well-being improvements rests on empirically shaky grounds, see Preston 1975 and Steinberger, Lamb & Sakai 2020 for empirical evidence.	This debate or controversy is captured in the section.	Julia Steinberger	University of Lausanne	Switzerland
7939	25	5	25	12	These two last sentences in this paragraph seem to offer a balanced view of the role of capitalism. On the one hand, capitalism was instrumental to global wellbeing and poverty alleviation (1. Sentence - there are more nuanced views which are not mentioned here). On the other hand, capitalism is responsible for climate change (2.Sentence - this seems to reflect a consensus view). Combined, these two sentences read as an attempt to offer a balanced review of the pros and cons on capitalism, which is not appropriate in the context of IPCC. If there is a consensus that capitalism drives anthropogenic climate change, this shouldnt be balanced by pointing out that historically it also had some benefits.	The section has been edited.	Jevgeniy Bluwstein	University of Fribourg	Switzerland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
12879	25	11	25	11	(Pelling and Manuel-Navarrete 2011, Correct the second name no need to give two names for single author	Comment not understood. This is a co-authored paper by Pelling and Manuel-Navarrete; some people do use "Double-barrel" surnames like this	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
54553	25	13	25	17	This paragraph appears to be mis-written; because certainly climate mitigation could be achieved while ignoring SDGs, but with many negative consequences in terms of sustainability.	We disagree with this thought because many of the negative consequences will compromise the SDGs.	Government of United States of America	U.S. Department of State	United States of America
12881	25	18	25	18	(see also chapter 2) As Chapter not chapter	Thank you	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
10493	25	22	25	22	a word (mitigation ?) missing	Statement has been edited; thank you.	Philippe Waldteufel	CNRS	France
29531	25	22	25	22	Word(s) missing after 'between'	This has been corrected in our restructuring process; thank you	Government of Norway	Norwegian Environment Agency	Norway
51937	25	22	25	22	between what? and sustainable development?	This has been corrected in our restructuring process; thank you	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
72427	25	22	25	23	"The close link between and sustainable development is also recognised in policy circles": missing part of the sentence	This has been corrected in our restructuring process; thank you	Sylvain Pichat	University of Lyon, Ecole nor	Germany
80903	25	22	25	22	missing word after "between"	This has been corrected in our restructuring process; thank you	Heinz Wittenbrink	FH Joanneum University of A	Austria
82497	25	22	25	23	"The close link between and sustainable development is also recognised in policy circles." In this sentence, I think there is a word missing "The close link between () and sustainable"... please re-write for clarity.	This has been corrected; thank you.	Fei Luo	VU Amsterdam	Netherlands
22725	25	23	25	26	This quote is partial and leaves out several phrases, especially on ecosystems and food production - at least insert "... as appropriate	This quote has been taken out.	Government of France	Ministère de la Transition éc	France
14447	25	25	25	26	The UNFCCC must be quoted precisely. At the very least, ellipsis (...) are needed to show that there is additional text in between "the climate system" and "enable economic development etc...".	This quote has been taken out.	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
22727	25	33	25	36	another reference that can be added to this sentence is Kayal et al. 2019, where are discussed several issues related to the vulnerability of the poorest to climate change, while being least responsible and least resilient towards it. REF: Kayal M, Lewis H, Ballard J, Kayal E. 2019. Humanity and the 21st century's resource gauntlet: a commentary on Ripple et al.'s article "World scientists' warning to humanity: a second notice". Rethinking Ecology 4:21. https://doi.org/10.3897/rethinkingecology.4.32116	This reference has been added thank you.	Government of France	Ministère de la Transition éc	France
4193	25	38	25	38	pursed -> pursued	Thank you this has been corrected	Marcel Wissenburg	Radboud University Nijmegen	Netherlands
53435	26	1	26	19	You argue that SD offers a resolution of the tension between economic growth and climate change; followed by stating that degrowth/postgrowth scholars disagree on the possibility of decoupling, followed by a counter-statement that many scholars still believe that economic growth is important for tackling climate change. What you do here is to provide a biased, rather than balanced viewpoint of recent, relevant scholarship. I suggest to remedy this framing to make it more balanced.	This text has been revised; thank you.	Elke Pirgmaier	University of Lausanne	Switzerland
4369	26	3	28	9	Add reference : Sharma S , Bharat A, DasV.M (2013), Study of soil : An important consideration for sustainable settlement development – in context of water resources, International journal on emerging technologies, Vol. 4 (1) : pp 139 – 148 June 2013 , ISSN no. (print) : 0975 – 8364 ISSN no. (online) : 2249– 3255	Rejected as this is not recent literature and does not add much to the argument.	Alka Bharat	Maulana Azad National Instit	India
4371	26	3	28	9	Add reference: Ahmed S , Bharat A (2014), Designing the city according to the wind : Using WASP to minimize the impacts of High Rise building complex on human comfort, International journal of Innovative research in Advanced Engineering, Vol.1, issue 5, June 2014, pg. 118 -123, ISSN: 2349-2163	Rejected as this is not recent literature and does not add much to the argument.	Alka Bharat	Maulana Azad National Instit	India
4373	26	3	28	9	Add reference : Nair Rekha .S, Bharat A, Manu G. Nair (2012), Framework for Integrating adaptation policies for climate change in development plan, International Journal of Environmental Engineering and Management, Vol. 3 , No. 3 ,2012 , pp 235-249, ISSN 2231-1319	Rejected as this is not recent literature and does not add much to the argument.	Alka Bharat	Maulana Azad National Instit	India
82499	26	3	26	5	Please re-write this long/complicated sentence in a way that is more accessible for normal readers.	Text has been revised.	Fei Luo	VU Amsterdam	Netherlands
86417	26	3	26	12	While reporting assumptions present in some literature, more emphasis throughout section 1.4.2 should be given to overwhelming evidence pointing to the fact that the search for a "decoupling" between economic growth and climate action is mostly inconsistent with the fact that long-term economic growth cannot exist without solving the climate crisis. Therefore, economic growth and climate action are inherently coupled, but positively - not negatively - correlated. Evidence for this comes from countless observational studies and modeling assessments on how climate will affect economic activity by altering basic demand factors (food, water) as well as infrastructure, ecosystem economic value, health crises, geopolitical unrest and migration crises.	We believe we have reflected this view in the text.	Lorenzo Campus	Ca' Foscari University of Veni	United States of America
12883	26	6	26	6	and Van Den Bergh 2016; Casadio Tarabusi and Guarini 2013). Cite only single name for author. No need of three and two names for own author. Cause confusion in references.	This reference has been deleted.	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
4707	26	12	26	16	The empirical evidence that fossil fuel use can only account for 1/5 of the improvement in international life expectancy should be noted here (Steinberger Lamb & Sakai 2020). The effort to model decent living energy for all as well (Millward-Hopkins et al 2020).	Citation either amended or deleted.	Julia Steinberger	University of Lausanne	Switzerland
4739	26	12	26	16	Kate Raworth's "Doughnut Economics" should be cited here as very influential.	Done, thank you.	Julia Steinberger	University of Lausanne	Switzerland
12885	26	12	26	12	Okereke, C. and Massaquoi and S. 2017; Shang. Remove C and S no need of abbreviations names here.	Citation amended; thank you.	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
15453	26	12	26	12	"Okereke, C. and Massaquoi and S. 2017"; Initials are not necessary here.	Thank you this has been corrected	Hiroaki Kondo	National Institute of Advance	Japan
49787	26	12	26	16	This is an opportunity to refer to indigenous knowledge, law and governance as models for just sustainable development. For example, the world view of the Tsleil-Waututh Nation from British Columbia, Canada, already include the SDGs in their laws. The dominant colonial, patriarchal, and white supremacist systems created the extractive and oppressive capitalist economy responsible for human-induced climate change within a few centuries. Indigenous societies managed resources and stewarded complex and sustainable economies for thousands of years. Indigenous worldviews and traditionally matriarchal societies need to be incorporated in the global climate mitigation and adaptation discourse as models of success.	We don't see the need for this in the text. We agree that the indigenous knowledge is relevant.	Chloe Hartley	Tsleil-Waututh Nation	Canada
70117	26	12			(Blas et al. 2020) https://linkinghub.elsevier.com/retrieve/pii/S2211467X20300961	It is not clear where this reference should go and the need for it.	Rayner Andersen	Department of Fisheries and	Canada
74689	26	12	26	16	The narrative about degrowth or post growth doesn't provide suggestions to Integrating Climate Mitigation and the Development Imperative. In addition, it is at odd of the massive economic downturn driven by the COVID-19 pandemic that is expected to have long term implications on development. Finally, references to degrowth or post growth are politically sensitive and are considered as a blocking point for further discussion. Consider removing them.	We disagree. The literature cited are peer reviewed and relevant for the section.	Irene Monasterolo	Vienna University of Econom	Austria
80905	26	13	26	13	"questions" instead of "question"	Thank you	Heinz Wittenbrink	FH Joanneum University of A	Austria

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
4709	26	16	26	16	The review on wellbeing and climate change mitigation of Lamb & Steinberger 2017 should be reflected here. Different understandings of wellbeing, included as represented in the SDGs, have different implications for mitigation framing and priorities.	We have noted that there is controversy about how wellbeing is measured. We have also indicated that different countries have different priorities on how they chose to tackle the SDGs.	Julia Steinberger	University of Lausanne	Switzerland
22729	26	16	26	19	We suggest to reformulate this sentence as well as add "also pointing the relationship between economic growth and technological innovation". The literature described in the previous sentences stresses the disjunction between economic growth and prosperity/good living. On the contrary, this sentence starts with however in order to emphasise an opposition. The literature described in this sentence emphasises growth, but also underlines the relationship between development and climate resilience. But development is more than economic growth. The literature that criticises development points precisely to the reduction of human development to economic growth and calls for a disconnection that allows growth to be complemented by well-being. There are therefore three positions: a radical critique of growth that calls for degrowth; on the contrary, an approach that reduces development and well-being to growth; and an intermediate position that, without rejecting growth, calls for a more inclusive understanding of development that integrates growth into the broader reference framework of well-being.	This text has been revised. Thank you.	Government of France	Ministère de la Transition écologique	France
25089	26	18	26	18	Suggest using an alternative word for industry-powered. Simply saying technologies might be OK?	This has been removed. Thank you	Minal Pathak	WGIII TSU, Ahmedabad University	India
45727	26	21	26	23	Please cite directly to the 2030 Agenda for Sustainable Development to strengthen this message. As the 2030 Agenda states e.g., "Climate change is one of the greatest challenges of our time and its adverse impacts undermine the ability of all countries to achieve sustainable development. ..." please write "a major focus" instead of "one of the foci of the SDGs" which is not adequate (see UN, General Assembly, A/RES/70/1, paragraph 14, 2030 Agenda, https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E).	The text has been revised, thank you.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
12887	26	22	26	22	2016; Ramos-Mejia et al. 2018; single name here	This reference is correct	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
80907	26	23	26	23	"recognizes" instead of "recognize"	Thank you this has been corrected	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
22731	26	25	26	25	We suggest to reformulate the term "human progress" as it does not necessarily lead to well-being. Numerous works, starting with Ulrich Beck's work, have used the expression reflexive modernity to underline how technological and technical progress create risks that reduce well-being. Anthropogenic climate change raises the issue of the disconnection between progress and well-being. While progress is a fundamental challenge, the link with well-being must be clarified, to avoid a contradiction. Progress produces well-being only if it is itself designed according to the objectives of sustainability.	This text has been edited, thank you.	Government of France	Ministère de la Transition écologique	France
49639	26	29	27	7	As of 2021, GGGI has 38 member countries, including Denmark, Mexico, and Korea, Rep. of, and 21 partner countries, including the EU, China, and Nepal.	This is noted but the implication for the text is unclear.	Eui-Chan JEON	Sejong University	Republic of Korea
49641	26	29	27	7	The OECD is also an international organization that actively supports green growth and publishes a number of related reports.	This is noted but the implication for the text is unclear.	Eui-Chan JEON	Sejong University	Republic of Korea
49643	26	29	27	7	Please, add and introduce Green growth to "1.4.1 Integrating Climate Mitigation and the Development Imperative: Relevant Concepts and their limitation".	Green growth has been added, thank you.	Eui-Chan JEON	Sejong University	Republic of Korea
49645	26	29	27	7	<Reference for Green Growth> Marco Capasso, Teis Hansen, Jonas Heiberg, Antje Klitkou, Markus Steen, Green growth - A synthesis of scientific findings, Technological Forecasting & Social Change 146 (2019) 390-402 Eric Hille, Muhammad Shahbaz, Imad Moosa, The impact of FDI on regional air pollution in the Republic of Korea: A way ahead to achieve the green growth strategy?, Energy Economics 81 (2019) 308-326 Danish, Recep Ulucak, How do environmental technologies affect green growth? Evidence from BRICS economies, Science of the Total Environment 712 (2020) 136504 Malin Song, Shuai Zhu, Jianlin Wang, Jijia Zhao, Share green growth: Regional evaluation of green output performance in China, International Journal of Production Economics 219 (2020) 152-163 Mehdi Bagheri, Zeus Guevara, Mohammad Alikarami, Christopher A. Kennedy, Ganesh Doluweera, Green growth planning: A multi-factor energy input-output analysis of the Canadian economy, Energy Economics 74 (2018) 708-720 Lin-Na Hao, Muhammad Umar, Zeeshan Khan, Wajid Ali, Green growth and low carbon emission in G7 countries: How critical the network of environmental taxes, renewable energy and human capital is?, Science of the Total Environment 752 (2021) Yoo Jae-Ho, Kim Hana, Jeon Eui-Chan, Analysis of Green Growth Policy Change with The Topic Modeling Method, Journal of Climate Change Research (2021) 67-75	Some of these relevant citations have been added, thank you.	Eui-Chan JEON	Sejong University	Republic of Korea
49647	26	29	27	7	<OECD Report> OECD, OECD WORK ON GREEN GROWTH, 2019 OECD, Reconciling green and inclusive goals (forthcoming 2020), 2020 OECD, Towards Green Growth? Tracking Progress: Four years of the Green Growth Strategy, 2015 OECD, Towards Green Growth? Tracking Progress: Key Findings and Recommendations, 2015 OECD, What we have learned from attempts to induce green growth policies?, 2013 OECD, "A review of "Transition Management" strategies", OECD Green Growth Papers, No. 2019/04 OECD, "SMEs: Key drivers of green and inclusive growth", OECD Green Growth Papers, No. 2019/03 OECD, "The distributional aspects of environmental quality and environmental policies", OECD Green Growth Papers, No. 2019/02 OECD, "Marine Spatial Planning: Assessing net benefits and improving effectiveness" Green Growth and Sustainable Development Issue Paper, 2017 OECD, Towards Green Growth in Emerging Economies: Evidence from Environmental Performance Reviews, 2019	These reports are well noted, thank you.	Eui-Chan JEON	Sejong University	Republic of Korea
49693	26	29	27	7	In a similar sense to sustainable development, there is 'Green Growth' and it is supported administratively and financially by GGGI. The Global Green Growth Institute (GGGI) was formed to support developing countries and emerging economies to achieve sustainable inclusive economic growth(https://gggi.org/partners/)	The concept of green growth has been added, thank you.	Eui-Chan JEON	Sejong University	Republic of Korea

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
78279	26	29	26	34	May want to refer to "climate resilient development pathways" in SR15	Done, thank you.	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
79965	26	30	26	31	A further reference for the concept of climate compatible development is the book 'Mainstreaming climate compatible development' that my co-authors and I wrote on the subject, exploring how it has been pursued in practice (this took the initial conceptual work of Mitchell and Maxwell further, into assessment of real-world case studies). Dupar, M., S. Maxwell, S. Bickersteth and A. Huhtala with M.J. Pacha (2015; reissued 2017). Mainstreaming Climate Compatible Development. London: CDKN.	This reference has been added, thank you.	Mairi Dupar	Overseas Development Institute	United Kingdom (of Great Britain and Northern Ireland)
54555	26	34	26	34	Figure 1.5 makes no explicit reference to poverty reduction.	This is correct. The text has been revised	Government of United States of America	U.S. Department of State	United States of America
30529	27	0	27	0	Figure 1.5 + Without explanation, this figure can be seen as if GHG net zero is achieved, all SDGs will be achieved as well. However this conflicts with the explanation given throughout the report that SDG has synergies and tradeoffs. + Moreover, the tradeoff of achieving net zero and SDGs will change depending on the level of development of each country and circumstances of access to resource. This figure should have careful explanation in the footnote to be understood accurately.	The text is illustrative and makes the point that development pathways that achieve the SDGs, and lowers GHG emissions could lead to climate-resilient development futures. The fact that such a pathways would seek the maximise co-benefits and minimise trade-offs has been noted in the text.	Government of Japan	Climate Change Division - Ministry of Environment	Japan
4365	27	1	27	3	Fig. 1.5 Add 'range' to make it Technical_Inpresent format it is very generic	Range is not needed as this is purely illustrative. Moreover the figure is not ours but taken from previous IPCC report.	Alka Bharat	Maulana Azad National Institute of Technology	India
4367	27	1	28	20	Define Scope of 'Equity'	Equity is defined in the glossary; thank you.	Alka Bharat	Maulana Azad National Institute of Technology	India
8961	27	1	27	3	Figure 1.5 is profoundly misleading, neglecting the systemic network of feedbacks that makes the pathways much more complex than what suggested by the oversimplified cause-effect chains in the figure.	The text is illustrative and makes the point that development pathways that achieve the SDGs, and lowers GHG emissions could lead to climate-resilient development futures. The fact that such a pathways would seek the maximise co-benefits and minimise trade-offs has been noted in the text.	Francesco Gonella	Ca' Foscari University of Venice	Italy
11105	27	1	27	1	Figure 1.5 doesn't really illustrate links the way that the text underneath it claims. It just tells three stories: a BAU story w.r.t. both emissions and the SDGs, a really nice story w.r.t both emissions and the SDGs, and one in between. Wouldn't it make sense to show that achieving the SDGs is particularly relevant for making a climate resilient world, while lowering emissions is particularly relevant for limiting global warming?	This is a valid observation. The text and the title of the figure have been revised.	Anthony Patt	ETH Zürich	Switzerland
85731	27	1	27	3	Suggest clarification. Figure 1.5 shows that all 17 SDGs will be achieved by following a pathway to net zero emissions and that no SDGs will be achieved by following the "business-as-usual" pathway. This implies that there are no trade-offs by transitioning to a pathway to net zero emissions. This messaging seems at odds with that in the Summary for Policy Makers (see Figure SPM.1). Is this figure meant to convey that 'business-as-usual' would fulfill a different subset of the SDGs than 'net zero'? This figure also seems at odds with the text in 3-9, Lines 34-41, which refer to trade-offs between some net-zero pathways and the SDGs.	The text is illustrative and makes the point that development pathways that achieve the SDGs, and lowers GHG emissions could lead to climate-resilient development futures. The fact that such a pathways would seek the maximise co-benefits and minimise trade-offs has been noted in the text. The figures does not suggest that there are no trade-off and synergies in climate compatible development pathways. The text and the title of the figure have been revised.	Government of Australia	Department of Industry, Science and Energy	Australia
6889	27	2	27	2	In Figure 1.5, please be explicit regarding whether the intention is to demonstrate links between climate change mitigation and sustainable development or the SDGs. If the focus is on SDGs, the title should mention SDGs instead of sustainable development. It will also be important to extend the assessment to sustainable development more broadly so that you can look beyond 2030.	Thank you, the title has been revised to mention SDG and the text makes relevant references to sustainable development more broadly.	Debra Roberts	EThekweni Municipality	South Africa
78281	27	2	27	2	Sorry couldn't find this in the SR15 report!	Chapter 5 of SR 1.5, page 480. decided to use the Figure actually within the report	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
8963	27	4	28	19	The list of different conceptual frameworks and mindsets does not help whatsoever to comprehend Figure 1.5, nor the actual points addressed by the document. It seems that a truly systemic study using systems dynamics modelling of the real accessible pathways is worryingly lacking in the discourse. See for example the work by H.T. Odum (Odum, H.T., 1996. Environmental Accounting, Energy and Environmental Decision Making. Wiley, New York, NY).	The text has been revised to draw out the key point that pursuing climate goals in the context of sustainable development requires decisions and choices that exploit and maximise the synergy and minimises the trade-off between climate mitigation and other sustainable development goals.	Francesco Gonella	Ca' Foscari University of Venice	Italy
10495	27	4	27	5	I am unable to understand how figure 1.5 support the conclusion related here.	The figure has been replaced and the relevant revised.	Philippe Waldteufel	CNRS	France
86419	27	4	27	7	Figure 1.5 cites IPCC 2018a (= SR1.5) as source. While SR1.5 extensively discusses integration and synergies between development, climate response and the SDGs (Sections 4 and 5), I could not find that specific Figure in SR 1.5. Both the Figure and the text convey the need for an integrated and syngic approach to reach climate mitigation goals as well as the SDGs. I believe more clarity and emphasis should be given to the following: 1) That while all SDGs are interconnected and interdependent, the preservation of climate (SDG 13) is the core physical basis upon which all other SDG depend; 2) That climate Mitigation, above Adaptation and above all other SDGs, has a strong scientific basis for time sensitivity of targets. No amount of Adaptation will be sufficient to compensate missed Mitigation targets, and no amount of effort on all other SDGs will be able to achieve the same results within respective SDGs if faced with a world that "already" passed or overshoot temperature limits. 3) That, unlike temporarily missing other SGG goals, missing deadlines for climate Mitigation targets will inevitably affect human livelihoods for hundreds or thousands of years.	The figure has been replaced with the one that in the body of the SR1.5. The previous one was in the frequently asked question section which made it hard for you and others to find. The relevant text has also been extensively revised to make it sharper and help to describe the figure and the message it intends to convey.	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
4711	27	8	27	10	The Green New Deal is famously agnostic on growth and is certainly not part of a green growth or ecomodernist agenda. Mastini et al 2020 cover the compatibility of the GND with degrowth.	The text has been revised, thank you.	Julia Steinberger	University of Lausanne	Switzerland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
27541	27	8	27	22	Delete "In industrialised countries terms such as ecological modernisation, eco-modernism, the Green New Deal are often used to convey ideals of development pathways that take sustainability and environmental limits seriously (see e.g. Dale et. al (2015). The green economy has gained popularity in both developed and developing countries as an approach for harnessing economic growth to address environmental issues (Bina 2013; Georgeson et al. 2017). Under a green economy, countries would enhance economic growth while ensuring that it does not undermine ecological systems. Critics however argue that green economy ultimately emphasises economic growth to the detriment of other important aspects of human welfare such as social justice (Adelman 2015; Death 2014; Kamuti 2015). It is also argued that the central idea of the green economy that it is possible to decouple economic activity and growth (measured as GDP increment) from increasing use of biophysical resources (raw materials, energy) and GHG emissions is flawed (Jackson and Victor 2019; Parrique et al. 2019; Hicel and Kallis 2020). Furthermore, some have observed that while terms like the green economy and climate resilient development offer conceptual tools for imagining a synergistic relationship between development and climate mitigation, they generally offer limited practical guidelines for reconciling the tensions that are often present in policy making (Dale et al. 2015; Ferguson et al. 2015; Kasztelan, 2017 Kotzé 2018), as terms used such as 'green economy' are not necessarily associated with sustainable development.	rejected. there is no strong reason given for why the text should be deleted. However some parts of the text has been revised to make the meaning sharper.	Eleni Kaditi	Organization of the Petroleum	Austria
6891	27	10	27	10	This is rather an old citation.	Citation has been updated, thank you.	Debra Roberts	EThekweni Municipality	South Africa
48621	27	12	27	13	Expand sentence as follows: 'Under a green economy, countries would enhance economic growth while ensuring that it does not undermine ecological systems, is inclusive in its decision-making and equitable in its outcomes'. See for example International Labour Organization (ILO), Guidelines for a Just Transition Towards Environmentally Sustainable Economies and Societies for All. Geneva: ILO, 2015.	text has been revised, thank you.	Lorraine Elliott	The Australian National University	Australia
86421	27	13	27	22	Text in this paragraph and throughout the section should discuss 1) How literature and discussion on social justice should incorporate a time dimension, considering social impacts of climate devastation for future generations; 2) How literature and discussion on economic growth rely on a short-termistic definition of growth, instead of an assessment of growth over at least the remaining of this century, and on growth as measured by GDP, which does not incorporate externalities. Somewhere in Chapter 1 and/or in the Report, an extensive section dedicated to a balanced critique of the continued use of GDP to measure economic growth should be provided	The section touches on the key terms suggested including social justice, sustainable development, and a critique of the inadequacy of GDP as a means of measuring growth.	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
5157	27	15	27	18	"It is also argued that the central idea of the green economy that it is possible to decouple economic activity and growth (measured as GDP increment) from increasing use of biophysical resources (raw materials, energy) and GHG emissions is flawed (Jackson and Victor 2019; Parrique et al. 2019; Hicel and Kallis 2020)". COMMENT: First, a systematic review of decoupling was published in ERL in 2020. REF#1: Haberl H, Wiedenhofer D, Virág D, Kalt G, Plank B, et al. A systematic review of the evidence on decoupling of GDP, resource use and GHG emissions, part II: Synthesizing the insights. Vol. 15, Environmental Research Letters. Institute of Physics Publishing; 2020. See also Figure 2 in that reference. Second, the structural break in global energy-GDP (between historical reality and future IAM/other pathways) is studied in a new RSER paper, just published in March 2021. (see Figure 1 and 2). The paper studies 33 studies of economy-wide rebound (average rebound 50-60%) and also finds that many of the rebound channels are missing in models. Thus large rebound effects may be missing from the modelling space, which could explain why models are potentially too optimistic about green growth: REF#2 = Brockway P. E., Sorrell S.R., Semieniuk G., Heun M.K., Court V. (2021) Energy efficiency and economy-wide rebound effects: a review of the evidence and its implications. Renewable and Sustainable Energy Reviews. Available at: https://doi.org/10.1016/j.rser.2021.110781	This reference has been added and text revised, thank you.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
61157	27	15	27	18	More evidence in support of this claim: Vadén et al., 2020. Decoupling for Ecological Sustainability: A categorisation and review of research literature. Environmental Science and Policy, 112, 236-244; Vadén,T.;Lähde,V.;Majava,A.;Järvensivu,P.;Toivanen,T.;Eronen,J.T.RaisingtheBar:OntheType,SizeandTimelineof a 'Successful' Decoupling. Environ. Polit. 2020.	Reference added, thank you.	Steven R Smith	CES, University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
70115	27	18			(Vadén et al. 2020) https://www.sciencedirect.com/science/article/abs/pii/S1462901120304342	Reference added thank you.	Rayner Andersen	Department of Fisheries and	Canada
70119	27	18			(Capellán-Pérez et al. 2019) https://www.sciencedirect.com/science/article/pii/S2211467X19300926?	Reference noted thank you.	Rayner Andersen	Department of Fisheries and	Canada
66751	27	23	27	31	The para only includes discussion of synergies, while the introductory sentence also mentions trade-offs. Perhaps some discussion of each is needed.	Thank you. Text has been revised	Navroz Dubash	Centre for Policy Research	India
70259	27	23		24	Policies and idealized development pathways, such as GND and green economy, can be analyzed according to their synergies and tradeoffs. But synergies and tradeoffs offer little insight into operationalizing development pathways. They are analytical tools that can underpin decision-making.	Thank you. This point is reflected in the text.	Phillippe Tulkens	European Union (EU) - DG Re	Belgium
45421	27	25	27	25	"Nerini 2018" should be "Fuso Nerini et al. 2018" (double surname and more than one author)	Thank you. Corrected.	Elena Verdolini	University of Brescia and Eur	Italy
5189	27	27	27	27	Instead of "renewable", it would be more adequate to refer to low-carbon energies . Doing so, you do not exclude nuclear, which is an appropriate source of energy in developed countries.	Thank you, text has been revised	Michel SIMON	Retraité/ Pdt d'association	France
61599	27	27	27	28	"For example, energy efficiency and renewable energy programs can have positive effect in clean air and health, job creation, community cohesion and addressing inequities." Here the term "renewable energy" is used where "clean, low carbon energy" would work better. Some renewable energy sources can have significant negative effects for clean air and health, but since all clean and low-carbon energy sources are based on non-combustion technologies pretty much by definition, the term is much more accurate. It also evades the problems that a high dependency on (renewable) biomass use can have for local ecosystems, soil and nutrients and biodiversity, without the need to explain this caveat.	Thank you, text has been revised	Rauli Partanen	Think Atom	Finland
8051	27	28	28	31	Please correct and delete or expand as necessary: "and crops that can be used for food production" cannot be taken by afforestation.	Thank you this has been corrected	Joachim Rock	Thuener-Institute of Forest E	Germany
82501	27	28	27	28	"in clean air and health" --> "in clean air and human health"	Thank you, text has been edited.	Fei Luo	VU Amsterdam	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
7809	27		27		On Figure 1.5, this figure may mislead to show that achieving all SDGs may lead to lower emissions and lowest temperature increase. Discussions in 1.4.1 shows complexity of relationship between sustainable development and narrow climate focused policies (page 27, lines 29-31). Please reflect those views in the figure.	The text is illustrative and makes the point that development pathways that achieve the SDGs, and lowers GHG emissions could lead to climate-resilient development futures. The fact that such a pathways would seek the maximise co-benefits and minimise trade-offs has been noted in the text.	Mitsutsune Yamaguchi	Research Institute for the Inn	Japan
70261	28	1		9	Please also mention adaptation in conjunction with sustainable development	Adaptation has been mentioned a few times	Philippe Tulkens	European Union (EU) - DG Re	Belgium
6893	28	2	28	43	The meaning of this statement is not clear	This has been clarified in our restructuring process. We hope it is clearer now.	Debra Roberts	EThekwini Municipality	South Africa
25091	28	2	28	8	This para on types of co-benefits using a single reference doesn't add that much value. We are not even using this for the assessment. Delete? Karlsson makes several other interesting points which might be worth adding instead of this finding	This sentence has been edited out.	Minjal Pathak	WGIII TSU, Ahmedabad Univ	India
82503	28	3	28	3	"in has been suggested to label (??)" Please make it a little bit explicit for understandings and sentence coherence.	This text has been deleted.	Fei Luo	VU Amsterdam	Netherlands
51939	28	12	28	12	change the phrase "climate change" to "climate actions" or "climate change mitigation"	Text has been revised and some changes made where relevant	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
86423	28	14	28	17	Please refer to my previous Comment on Page 20, Lines 24-28 about "Just transition". Text might include again a mention to a necessary space + time dimension to the definition of equality and justice. In addition, a mention should be given to the fact that in COP negotiations developed countries are recognized to be responsible for a larger share of the burden of mitigation efforts, both because of higher economic power and because of higher responsibility for cumulative historical emissions.	Just transition and the concept of differentiated responsibilities have been added in the text.	Lorenzo Campus	Ca' Foscari University of Veni	United States of America
49789	28	20	32	29	Inherent Indigenous rights, which are also recognized and affirmed by international law (the United Nations Declaration on the Rights of Indigenous People; UNDRIP), and climate justice should be incorporated in the policy, governance and models for sustainable development. Globally, Indigenous People are taking a strong leadership and governance positions on climate action and are leading the global movement to demand a transition away from a carbon-intensive economy, while also working to restore and protect natural ecosystems. Indigenous leaders and knowledge holders who are protecting the sacred, and speaking on behalf of the lands, waters, air, minerals, and all life within, rightfully deserve a voice in IPCC reports. Indigenous Peoples and governments demonstrating climate leadership are contributing far beyond direct action and grassroots movements - which in themselves hold tremendous value - but also extend to their own government and economic development reform, international climate diplomacy, legal action, and the ongoing assertion, exercise and advancement of inherent Indigenous and treaty rights. Indigenous Peoples are stewards of approximately 80% of global biodiversity. Without adequate inclusion of Indigenous Peoples and governments, Indigenous Knowledge, knowledge systems, worldviews, and laws, there will remain significant gaps in the global understanding of climate change mitigation and adaptation. TWN would like to see the work of Indigenous scholars incorporated in IPCC reports, especially with respect to Indigenous Knowledge.	The text incorporates climate justice but we do not think this is the place for expanding on the concept as suggested here.	Chloe Hartley	Tsleil-Waututh Nation	Canada
54557	28	20	28	20	This section repeats material from the previous subsection. Section 1.4.2 reads like it would work better if it were the beginning of Section 1.4	The text has been edited to eliminate or at least reduce redundancies	Government of United States of America	U.S. Department of State	United States of America
10497	28	21	28	23	It might be relevant to mention in this paragraph that SDG#13 aims to "combat climate change and its impacts"	The text mentions that climate action is one of the 17 SDGs	Philippe Waldteufel	CNRS	France
14449	28	21	28	21	Delete "the foci of". Climate action "is" an SDG. Also correct typo "Sustainable Develop Goals". Delete "by the world leaders". Not necessary, sounds journalistic, and not universally true for all countries. The fact that these are "UN" sponsored should be mentioned, and the 2030 Development Agenda also highlighted. So "Climate action is one of the 17 UN Sustainable Development Goals, agreed in 2015 as part of the 2030 Development Agenda, as a global framework to..."	Thank you for raising these.	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
45729	28	26	28	26	Please write "2030 Agenda for Sustainable Development" instead of "2030 Development Agenda". Rationale: An incorrect name of the 2030 Agenda is used. It is also misleading: Unlike e.g. the Millennium Development Goals (MDGs), the SDGs are not (purely) describing a development agenda.	Changed to "2030 Agenda for Sustainable Development"	Government of Germany	Federal Ministry for the Envir	Germany
8965	28	28	28	30	It is clear here that the SDG fragmentation in targets and indicators is seen as a way to better manage the actions towards their realization. The opposite may be true. Creating hundreds of indicators not only obscures the intrinsically systemic nature of the problems addressed, but may also easily give rise to the shift of the attention from the objective of the action to the relative indicator, whose capability of addressing a real effectiveness of the action will not take into account the effects on the other ones.	Valid point but does not have implication for revising the text.	Francesco Gonella	Ca' Foscari University of Veni	Italy
8219	28	34	29	6	In regards to the discussion of GHG and GDP, I suggest to mention the alternative way of measuring GGDP (Green gross domestic product) and it's advantages and disadvantages	This would be an extensive discussion in itself and is outside the scope of Chapter 1.	Frida Zahlander	DanChurchAid	Denmark
86425	28	34	28	46	I refer to my previous Comment on the positive correlation between growth and climate action as it is relevant here: I believe the text here does a good job of describing the wide range of correlation levels across different countries between income and per capita emissions. Maybe more emphasis should be given to the Kaya dimension of the system, pointing to energy intensity of the economy and carbon intensity of energy (also in line with the information in Chapter 2 and the Summary for Policymakers). At the same time emphasis should be given to the fact that historical pathways to development passing through industrialization (and therefore typically higher emission levels) are not the *only* pathways to development; LDCs do not need to necessarily follow the same historical pathways to development of today's developed countries.	We have updated the text in the section to reflect that variations in country/regional context and capabilities mean different pathways are needed to fulfill the SDGs including climate action.	Lorenzo Campus	Ca' Foscari University of Veni	United States of America
45425	28	36	31	46	Please add reference to the different panels when explaining the figure in text	Thank you, explicit references to the pannels has been added However, with futher editing the graph has been reduced to a single panel	Elena Verdolini	University of Brescia and Eur	Italy
14451	28	40	28	42	"Some countries have... emissions and income". What is the point of this statement? Surely it is obvious. This might be better phrased as "There is a wide range of GHG emissions and income per capita". But even this is hardly new knowledge.	This sentence and paragraph has been deleted as the figure panel on income has been deleted as part of the response to comments on the figure.	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
51941	28	42	28	43	"has come increase income" not clear.	This has been corrected in our restructuring process, thank you	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
51943	28	44	28	45	"between gdp increase and almost every more..." unclear.. Rephrase	This has been corrected in our restructuring process, thank you	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
8221	29	1	29	1	Mentioning LDC without a explanation of the acronym. The explanation comes on page 31 line 20-21	This paragraph has been deleted as the graph has been updated and no longer includes LDCs.	Frida Zahlander	DanChurchAid	Denmark
15455	29	1	29	1	"LDCs": The definition of 'LDC' should not be written in page 31 but here.	Thank you	Hiroaki Kondo	National Institute of Advance	Japan
50559	29	1	29	1	"LDC" is used for the first time here and should be defined.	thank you	Anne Marie Treguier	CNRS	France
6895	29	3	29	3	Please replace LDCs with the full term. The acronym is used only 3 times in the Chapter.	thank you	Debra Roberts	EThekwini Municipality	South Africa

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
10499	29	7	29	10	This sentence is complicated. Moreover, my understanding of what Dubash is saying is somewhat different.	The sentence has been shortened and simplified and the reference rechecked.	Philippe Waldteufel	CNRS	France
51875	29	11	29	15	Equitable access to sustainable development as discussed in this section should be emphasized and included in the different mitigation pathways. This is a precursor for Just Transition which requires reducing the distributional effects of transitioning to low carbon economies	The challenge of sustainable development is discussed addressing the need to limit GHGs while also enhancing human development. Issues of justice are also discussed.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
86427	29	17	29	17	"Low emissions alone are not adequate to fulfil the SDGs." In line with my previous Comment for Page 27, Lines 4 to 7, I believe text could be edited to: "Low emissions alone are not adequate to fulfil the SDGs, while at the same time all SDG goals are conditional to meeting emission reduction targets, and emission reduction targets carry science-based time deadlines for fulfillment".	Included "Low emissions alone are not adequate to fulfil the SDGs, while at the same time all SDG goals are conditional to meeting emission reduction targets."	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
8055	30	1	37	2	Figure 1.6: Please revise figure. The contrast of the colouring in panels a) and b) is too weak, several regions can hardly be distinguished, and the 1.5 and 2°C emissions curves are not legible, too..	Reduced the number of colours used to 5, one for each of the major IPCC regions. The 21 IPCC regions plotted are labelled on the plot. Removed reference to the 1.5 and 2 degree curves.	Joachim Rock	Thuenen-Institute of Forest Ecology	Germany
8057	30	1	37	2	Figure 1.6: Please revise figure, panel c). If the x-axis displays the mean or a cumulative measure of the SDGs and other sustainability goals, a transformation pathway that lowers this mean / accumulation is very unlikely to be accepted. Societies will strive to compensate reductions in one aspect by gains in another, so the mean / sum over all aspects should not decrease.	Simplified the pathways to a horizontal pathway and a vertical pathway.	Joachim Rock	Thuenen-Institute of Forest Ecology	Germany
14453	30	1	30	15	Figure 1.6 is intriguing, but needs to be presented more clearly. At the moment, over a quarter of the page is taken up by notes. It is only possible to read the notes by magnifying the text considerably, which I suspect most people won't take the time to do. The notes are interesting, telling an important story, and without them it's really difficult to interpret the figures. I therefore suggest that the text in the notes, from "Panels a and b show that regardless of how progress and development levels are measured..." to the end should be included in the main body of the report.	Some text moved; single panel used	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
15457	30	1	30	4	In the panel c (original figure), why are there three SDG rings? Shouldn't be the broken lines indicated to show the direction with feather of arrows?	Simplified the SDGs circle to one circle - situated in relation the level of global per capita emissions needed in 2030 to be on path towards fulfilling the Paris Agreement on the vertical axis (serving as a proxy for SDG13) and the HIDH on the horizontal axis (serving as a proxy for SDGs 3, 4 and 8).	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan
15459	30	1	30	4	The legend for emission curves should be written in panel b) (left hand side). I cannot find the emission curves for 2010-2100 in panel b) (left hand side).	Removed this reference	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan
20355	30	1	30	5	The figure is, quite frankly, very confusing to read. The bad image quality and embedding the caption and notes to the image doesn't help it. Why a) is on the right and b) is on the left? The x-axis in a) is impossible to interpret for what it depicts. "SDGs and other aspects" is hardly a quantity that one can plot (or to have much meaning to the plot, anyway). I don't see the red and orange lines that the legend presents anywhere in the figure. The b) panels are not much clearer. Does it just show that GDP/capita and life expectancy have increased concurrently with emissions? What years the bubbles are from? How these relate to the global average? What do the green horizontal dashed lines represent. This is all very confusing.	Removed green lines and instead included grey "sustainable development" zone for the period 2030 to 2100, where countries increase human development levels while also decreasing per capita GHG emissions. Removed reference to orange and red lines and emissions curves (not relevant)	Tommi Ekholm	Finnish Meteorological Institute	Finland
45423	30	1	30	1	the wording "panel b)" appears before the wording "panel a)" in line 1, above the figure. Furthermore, panel c is only mentioned in the tiny notes to the figure. Perhaps revisit	The figure consolidated into a single panel and this is no longer an issue.	Elena Verdolini	University of Brescia and European Commission	Italy
45695	30	1	37	2	Figure 1.6: Please revise figure, panel c). If the x-axis displays the mean or a cumulative measure of the SDGs and other sustainability goals, a transformation pathway that lowers this mean / accumulation is very unlikely to be accepted. Societies will strive to compensate reductions in one aspect by gains in another, so the mean / sum over all aspects should not decrease. In addition, the caption is odd and there seems to much lengthy text in the caption. Please see also our comments on Figure TS.2.	These lines have been removed and replaced with two "sustainable development pathways" one verticle and the other horizontal. The "sustainable development corridor" indicates the need to increase development with the text moving from top to bottom, left to right.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
50431	30	1	30	5	Cannot see clearly	Revised figure	Hoy Yen Chan	ASEAN Centre for Energy	Malaysia
66753	30	1	30	5	Panel C of this figure risks mis interpretation. It offers so many possible pathways, that it risks an almost 'anything goes' interpretation. Also, the most confusing aspect is the exact nature of what is on the x axis. Panel a and b have clearer messages, but not particularly novel ones. This may be a bit of a missed opportunity to really spell out the development mitigation linkage in a conceptually clear manner.	We have simplified the pathways to their most simple representation - a horizontal development pathway and a vertical transformation pathway.	Navroz Dubash	Centre for Policy Research	India
85733	30	1	30	5	Comments on Figure 1.6: 1) Suggest the figure caption better explains the content in the panels. 2) Suggest the panel titles are spatially aligned with the panels themselves, e.g. the title for panel a is below panel c. 3) Suggest improving the readability of the labels for the dashed lines on panel a and panel b, they cannot be read. 4) Suggest clarifying: what is the significance of the size of the circles? 5) What does the x-axis represent in subplot c? 6) Consider simplifying all subplots. They contain too many elements and are difficult to interpret.	Clarified that the size of bubbles reflects total GHG emissions for a region. Ensured the axes are labelled. Simplified plots.	Government of Australia	Department of Industry, Science and Energy	Australia
4715	30	3	30	3	Correlation is not causation and empirical facts have to count for something. Growth in CO2 emissions can account for almost 3/4 of growth in GDP, but less than 1/4 in life expectancy, as shown in Steinberger, Lamb & Sakai 2020. The causal link between fossil fuel use and improvement in health is thus conclusively disproven and should not be represented in figure 1.6. Just because two things have grown together in the past does not make them causally connected: this can be empirically tested. This chapter should reflect the true complexity of development: what is necessary for well-being and what is necessary for economic growth are in fact very different. See Figure 2 table 1, of Roberts et al 2020 "Four agendas for research and policy on emissions mitigation and well-being" for an alternative framing of trajectories.	No action - The plot is not of causation, but of changes over time... and how currently some countries are far from past global averages... let alone current global averages. These are plots regarding climate change and development inequity... Highlighting the difference between development pathways and transformation pathways.	Julia Steinberger	University of Lausanne	Switzerland
72419	30	3	30	3	The color range e.g. light to dark yellow renders the reading almost impossible. Suggestion: use different marquer shapes rather than colors	Changed the colour scheme	Sylvain Pichat	University of Lyon, Ecole normale supérieure de Lyon	Germany
82505	30	3	30	4	Please make the green dashes lines more clear for all years...	Deleted green lines	Fei Luo	VU Amsterdam	Netherlands
15461	30	5	30	5	The description of panels a) and b), which are different from original figure, should be written in the legend of Figure 1.6.	Made sure descriptions match	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
22733	30	5	30	5	We suggest to make this figure more readable. It is blurry and the text is too small	Have improved the quality of image and increased the size of fonts.	Government of France	Ministère de la Transition éco	France
54559	30	5	30	5	Figure 1.6 is very confusing. Too much going on. Needs improvement.	Simplified diagrams	Government of United States of America	U.S. Department of State	United States of America
2203	30		30		Consider changing the color of the developing countries in Figure 1.6, panel c, to make a bigger contrast with the Developed countries.	Colouring improved	Marina Albuquerque de Andrade Fleury	Instituto Universitário de Lisboa	Portugal
2205	30		30		The title of Figure 1.6 appears to be changed. See letter b) comes first than the letter a).	The title of Figure 1.6 appears to be changed. See letter b) comes first than the letter a).	Marina Albuquerque de Andrade Fleury	Instituto Universitário de Lisboa	Portugal
7811	30		30		Figure 1.6 is hard to read and understand. Please make this readable.	Have improved the quality of image and increased the size of fonts	Mitsutsune Yamaguchi	Research Institute for the Int	Japan
9835	30				Fig. 1.6. The figure is in a very low pixel quality. It should be changed with a higher resolution figure too.	Enhanced the quality of figure (pixel count).	Government of Indonesia	Ministry of Environment and	Indonesia
70263	30				Low quality figure is impossible to evaluate	Have improved the quality of image and increased the size of fonts.	Philippe Tulkens	European Union (EU) - DG Re	Belgium
4721	31	1	31	38	Most of this text is lacking in any references and thus hard to justify in an IPCC report. Some suggestions on decoupling GDP from emissions: Haberl et al 2020, Wiedenhofer et al 2020. References on well-being achievements & mitigation: Lamb & Steinberger 2017, Rao & Min 2018, Millward-Hopkins et al 2020, Roberts et al 2020. Beyond this there is a vast literature on SDG compatibility with mitigation (see chapter 3 section 3.7 for some of this related to scenarios).	Thank you for these references. We have included some of these. We have also cross referenced Chapter 3.	Julia Steinberger	University of Lausanne	Switzerland
4717	31	4	31	8	The "relationship between per capita GHG emissions and development (including industrialisation) remains similar" is simply not true. Once again, correlation is not causation. See table 1 of Steinberger et al 2020 "Your money or your life? The carbon development paradox": CO2 emissions can statistically account for 3/4 of the growth in GDP (dropping to 41% if measured in PPP), but less than 1/4 of the improvement in life expectancy. The relationships are NOT similar. Article here. https://iopscience.iop.org/article/10.1088/1748-9326/ab7461	Thank you for this. We have dropped this statement and paragraph and changed the graph to use the Historic Index of Human Development (HIHD) and dropped the panels using life expectancy and income.	Julia Steinberger	University of Lausanne	Switzerland
45427	31	4	31	4	Please add reference to the different panels (in this case, panel b) when explaining the figure in text	Thank you this has been added	Elena Verdolini	University of Brescia and Euro	Italy
2983	31	9	31	9	For coherence, move this sentence to paragraph ending on page 31 line 3.	This has been reworked in our revised structure. Thank you	Beth Edmondson	Federation University	Australia
8967	31	9	31	17	In my opinion, this statement is rather confused. No "scientific" support is provided about the reliability of what said, that seems to pertain to a very oversimplified narrative.	This text has been deleted.	Francesco Gonella	Ca' Foscari University of Veni	Italy
25093	31	9	31	9	The way this is framed makes it sound prescriptive. Is there a way to frame this differently?	This text has been replaced by a discuss on issues of sustainable development, human development and GHG emissions.	Minal Pathak	WGIII TSU, Ahmedabad Unive	India
45429	31	9	31	10	The two sentences include the words important/importantly, perhaps worth revising	This has been reworked in the process of our restructuring thank you	Elena Verdolini	University of Brescia and Euro	Italy
51945	31	10	31	10	more of what? Time/efforts/investments... clarify.	This has been reworked in the process of our restructuring thank you	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
4719	31	11	31	11	Consider reframing industrialisation and developmet aspirations in terms of access to energy services which are clean, sufficient and affordable. This shifts the emphasis to what is necessary for poverty alleviation, health, education etc.	Development and industrialisation are concepts central to climate change and mitigation hence the framing around development. However, the point about energy being necessary for poverty alleviation, health and education is well taken.	Julia Steinberger	University of Lausanne	Switzerland
6897	31	18	31	25	This paragraph is highly policy prescriptive and not supported by any evidence.	Much of this paragraph have been removed and the remaining text simply highlights there are challenges fulfilling the SDGs that vary.	Debra Roberts	EThekweni Municipality	South Africa
45731	31	18	31	25	Please write "that different countries will focus on different priorities to implement the SDGs" instead of "that different countries will focus on different SDGs as priorities". Rationale: The whole paragraph argues that countries, due to different circumstances, focus on mitigation or adaption to different degrees. Whereas a focus on mitigation or adaptation would rather be a focus within a or within different SDGs not between individual SDGs. This would also concur with the intention of the SDGs that countries, due to national circumstances may prioritize or focus on different measures (e.g., improving the food production chain or change consumption patterns in order to reduce food waste), but should not cherry-pick the implementation of one goal over another.	This text has been revised and now states "Progress to date (Sachs et al. 2016) shows fulfilling SDGs is a challenge for all groups of countries – developed and developing – even though the challenge differs between countries and regions (Pradhan et al. 2017)."	Government of Germany	Federal Ministry for the Envir	Germany
50561	31	18	31	25	A few references to the literature would be useful in this paragraph.	Yes	Anne Marie Treguier	CNRS	France
4089	31	20	31	25	It is doubtful that issues facing each country could be summarised in this way. Richer countries too are increasingly struggling with a lot of adaptation measures like flood protection for river deltas.	The text has been heavily reduced highlighting challenges fulfilling SDGs differ.	Tatsuki Ueda	National Agriculture and Foo	Japan
10501	31	20	31	23	This is not the opinion of the present reviewer, who is deeply convinced that in order to achieve a minimum warming it is mandatory to reduce the world population down to the level of acceptable footprint; in this context, the LDC have a major role concerning mitigation, since many of them still suffer a significant population growth. However, inasmuch as the literature develops the idea presented here, of course AR6 is bound to report it. But then references ought to be given.	Good point regarding the references.	Philippe Waldteufel	CNRS	France
22735	31	22	31	22	Concerning the term "capabilities", it was used several times in the report. A definition would be important: is it synonymous with capability or is it understood in the sense of A. Sen and M. Nussbaum, referring for example to the question of well-being, freedom, agency. The difference is important because it introduces strong theoretical nuances. The distinction is necessary, especially for the translation of the term (for example in French).	This is an important point. I have been thinking of capability in the sense of "capacity" i.e. the ability to apply technologies and practices (policies included) required to limit climate change and its impacts.	Government of France	Ministère de la Transition éco	France
7941	31	26	31	38	This paragraph ignores recent comprehensive reviews on the limits of absolute decoupling between economic growth and GHG emissions. (Hickel and Kallis 2020, https://www.tandfonline.com/doi/full/10.1080/13563467.2019.1598964) (Parrique et al 2019, https://eeb.org/library/decoupling-debunked/) (Wiedenhofer et al 2020 https://iopscience.iop.org/article/10.1088/1748-9326/ab8429) (Haberl et al https://iopscience.iop.org/article/10.1088/1748-9326/ab842a)	This text has been revised and reference updated.	Jevgeniy Bluwstein	University of Fribourg	Switzerland
14455	31	31	31	32	What is a "sustainability corridor"? It's best not to use such slogans in a rigorous scientific report, or else, they should be explained. Also delete "the" before "social innovation".	This has been removed from the text in our restructuring, thank you	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
4737	31	32	31	32	What is this "sustainability corridor"? Is it referencing the "sustainable consumption corridor" work of Fuchs & DiGiulio?	The term "sustainable development corridor" is a graph annotation - highlighting a pathway for countries to reduce emissions while fulfilling SDGs and enhancing development in it multiple dimensions.	Julia Steinberger	University of Lausanne	Switzerland
5191	31	32	31	32	I recommend that you illustrate the point by giving examples. "GDP development is not necessarily tied to GHG emissions increase. Some countries, like Island, Austria and Costa Rica have developed and kept low emissions levels, thanks to national policies and favotable local geological conditions"	With the introduction of the Historic Index of Human Development in the figure for this section, and the removal of the graph with GDP per capita, along with efforts to reduce the word count, references to GDP have been removed instead the text focuses on SDGs, development and GHG emissions.	Michel SIMON	Retraité/ Pdt d'association	France
50859	31	34	31	38	Do you have a reference to substantiate these statements? Especially for the "...whereas in contexts where there is overconsumption, less material consumption may increase well-being" part?	References have been included	Bianca Wernecke	South African Medical Resear	South Africa

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
14457	31	39	32	2	I have not highlighted the many editorial hiccups in this draft chapter, but I feel compelled to draw attention to the editorial shortcomings of this paragraph. The last sentence is incomplete and there are other missing words, the Paris Agreement is mis-named, there are other typos, and the SDGs are named SGOs on two occasions. Please correct very carefully.	The text has been edited addressing these issues.	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
29719	31	39	32	2	It is important to discuss trade-offs between the SDGs and the PA, please consider including more details in the paragraph. Please consider citing relevant literature, and to highlight trade-offs in a clear and precise way. E.g. "there are synergies and tensions between climate mitigation and the other SDGs on the one hand, and among the other 16 SDGs on the other hand" is unclear. We suggest that you replace "tension" with "trade-off". Finally, the last sentence in the paragraph is not complete.	"synergies and trade-offs" are mentioned in the revised text along with relevant references for further information. However, space constraint mean the point has not been elaborated here.	Government of Norway	Norwegian Environment Agency	Norway
45733	31	43	31	44	Please delete this sentence: "The SDGs have a timeline of 2030 while mitigation action has a much longer timeline.", because it is misleading and includes no additional content information. Rationale: While it is true that most of the SDG targets have a 2030 timeframe (but not all of them), this sentence implies that in comparison to "climate action", "sustainable development action" itself is confined to a timeframe until 2030. Which is neither true nor useful with regard to the points made in this paragraph. It is also implied by the wording of several SDG targets (see for example SDG target 3.9 "By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals. [...]"). For climate action as well as sustainable development action is true that decisive action in the coming decade is necessary while at the same time long-term goals also need to be addressed. (Combined) long-term strategies are mentioned in following chapters. For matters of "thinking through conceptual and practical relationships" of both agendas (As stated in the beginning of the paragraph), 2030 targets of mitigation frameworks could easily referred to.	This sentence have been removed.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
78283	31	43	31	44	The notion that mitigation is just for the long-term is not supported in other chapters	This has been corrected while also condensing the text.	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
6899	31	44	31	44	Please explain what you mean by mitigation timeline.	The text in this section has been heavily condensed, and the expression "mitigation timeline" is no longer used.	Debra Roberts	EThekwini Municipality	South Africa
45735	31	44	32	2	These sentences after "Second, [...]" in this paragraph are incomplete and unclear in meaning. The points raised are not necessarily supporting the message that the integration between both agreements in terms of policy tools and timelines are limited. For example, if there are trade-offs, integration as a way of addressing trade-offs should be supported. The passage is also in contradiction to other parts of the report. If in this part the report argues that ways of integration are limited (without differentiation), the kinds of limitations should be stated very clearly. Especially as other sections of the report argue that mitigation and sustainable development efforts are closely interconnected or need to be enhanced (on different levels). We also propose to add a reference to section 3.7 to mention the influence of policy design and possible benefits for mitigation and sustainable development (for some policy areas) and/or to section 12.6.2 which highlights that "synergies and trade-offs resulting from mitigation policies [...] rather require a cross sectoral integrated or multiple-objective-multiple-impact policy framework". See also ch14, e.g., p.21 line 7-9 or chapter 17, Technical Summary p. 3, line 8-12.	The section has been revised and condensed, and these points have been removed. The section now includes cross reference to section 3.7.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
4093	31	45	31	46	SGDs -> SDGs	This has been corrected in our restructuring process, thank you	Tatsuki Ueda	National Agriculture and Food Organization	Japan
72431	31	46	32	1	"Third, there are serious questions about the extent to which the SDGs can be met within planetary boundaries and the health, wealth of global ecosystems." Missing part of the sentence "and the health, wealth"	This has been corrected, thank you	Sylvain Pichat	University of Lyon, Ecole normale supérieure de Lyon	Germany
78295	32	0	44	0	This section has a lot of overlap with Chapters 5 and 13-16. Need to check that material is consistent and whether key points could be summarised more succinctly making more use of forward references.	The later chapters have been checked and reference has been made to Chapter 5, in particular Section 5.2.1.	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
2207	32	1	32	1	It appears to have an "h" remaining in the phrase.	This has been corrected, thank you	Marina Albuquerque de Andrade Fleury	Instituto Universitário de Lisboa	Portugal
6901	32	1	32	2	Please check. The message is not clear.	This sentence has been removed.	Debra Roberts	EThekwini Municipality	South Africa
10503	32	1	32	2	there is a problem with the ending of this paragraph	This sentence has been removed.	Philippe Waldeufel	CNRS	France
15463	32	1	30	2	The sentence is interrupted.	This sentence has been removed.	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan
22737	32	1	32	2	the sentence "Fourth... NDCs and" is not complete.	This sentence has been removed.	Government of France	Ministère de la Transition écologique	France
22739	32	1	32	1	There is a problem in the sentence: "Third, there are serious questions... global ecosystems."	This has been corrected, thank you	Government of France	Ministère de la Transition écologique	France
27543	32	1	32	2	The paragraph remains incomplete.	This sentence has been removed.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
50563	32	1	32	2	incomplete sentence.	This sentence has been removed.	Anne Marie Treguier	CNRS	France
51877	32	1	32	2	The paragraph missing some words.	This sentence has been removed.	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
51947	32	1	32	1	"h wealth" probably meant to say "health"	This has been corrected, thank you	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
77177	32	1	32	2	Orphan sentence	This sentence has been removed.	Giacomo Grasso	ENEA	Italy
80909	32	1	32	2	Typo ("h" before "wealth" in the first line, missing last part of the sentence in the second line.	This has been corrected, thank you	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
82349	32	1	32	2	the last sentence ("Fourth, while the architecture of the Paris Agreement...") is not completed and so it is not clear, what the fourth point should be.	This sentence has been removed.	Amin Hasanein	Islamic Relief Deutschland	Germany
4091	32	2	32	2	The sentence is left undone at the end.	This sentence has been removed.	Tatsuki Ueda	National Agriculture and Food Organization	Japan
48623	32	2	2	2	words missing after "NDCs and ...?"	This sentence has been removed.	Lorraine Elliott	The Australian National University	Australia
4725	32	3	32	19	There are very strong arguments going against a single well-being indicator, since well-being via a human needs approach is understood as requiring the satisfaction of a finite number of multi-dimensional nonsubstitutable and satiable needs. Evidence for this can be found in O'Neill et al 2018 "A good life for all within planetary boundaries" Supplementary information figure 1. O'Neill et al 2018 is relevant for this section, as is Fanning & O'Neill 2019 "The Wellbeing–Consumption paradox: Happiness, health, income, and carbon emissions in growing versus non-growing economies" and Steinberger et al 2020 "Your money or your life? The carbon-development paradox"	The section focuses on the Historic Index of Human Development (HIHD) as it is similar in make up to the Human Development Index which is a widely accepted indicator, and the HIHD has a long time series allowing a much wider lens to be brought to the discussion. The question of how to satisfy local priority and delivery is well taken.	Julia Steinberger	University of Lausanne	Switzerland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
17183	32	3	32	19	The text here is perhaps overly narrow in its assessment of alternative well-being indicators. The lists and literature presented cover single indices that capture multiple dimensions in a manner similar to GDP, but the Eudaimonic well-being literature has long emphasized the importance of having multiple, non-substitutable goals and indicators. This goes back to Doyal and Gough (1991), Nussbaum (2003), also more recently summarised in Gough (2015, 2017), Lamb & Steinberger (2017), and implemented in O'Neill et al. (2018). The important points from these literatures that could come through here are: there is a convergence in different theoretical accounts to a list that quite well resembles the SDGs; the challenge is rather to do the additional work to ground these well-being dimensions according to local priority and delivery (e.g. how should they be satisfied?).	The section focuses on the Historic Index of Human Development (HIHD) as it is similar in make up to the Human Development Index which is a widely accepted indicator, and the HIHD has a long time series allowing a much wider lens to be brought to the discussion. The question of how to satisfy local priority and delivery is well taken.	William Lamb	Mercator Research Institute	Germany
49791	32	3	32	19	Indigenous knowledge, laws and governance must be included in discussion on defining the "good life" in this section. For example, the Tsleil-Waututh Nation guiding laws are de-coupled completely from economic systems and are focussed on doing right to each other, to the land, water, and air. Tsleil-Waututh strongly supports the call for greater inclusion of Indigenous knowledge in IPCC reports. Currently the report material barely acknowledges Indigenous knowledge, laws and governance.	This comment is well received. It may be a question of where values systems, cultures and ways of doing things should be addressed.	Chloe Hartley	Tsleil-Waututh Nation	Canada
14459	32	4	32	4	What is "the Good Life"? It is best not to use such slogans in an IPCC report. If they are used, then at least put them in quotation marks to indicate that they are an idiomatic expression, not a scientific term.	Thank you, this suggestion has been taken.	Joanna Depledge	Centre for Environment, Energy	United Kingdom (of Great Britain and Northern Ireland)
4723	32	5	32	6	There is by now a large literature on well-being, energy use and climate mitigation that this section ignores. Please see Lamb & Steinberger 2017 "Well-being and climate change mitigation", Rao & Min 2018, "Four agendas for research and policy on emissions mitigation and well-being" by Roberts et al, "Climate change and sustainable welfare: the centrality of human needs" by Ian Gough, Rao & Baer 2012 "Decent living" emissions: a conceptual framework" for a start. The concept of the good life as only being goods and services is not consistent with the state of the literature.	Thank you for these references. The paragraph was deleted but the references are useful and at least one is included elsewhere.	Julia Steinberger	University of Lausanne	Switzerland
22741	32	5	32	6	the sentence "well being... has dominated the literature" should be completed with "as a proxy of well-being.	Paragraph deleted due to space constraints.	Government of France	Ministère de la Transition écon	France
50861	32	5	32	6	A more recent reference than Roy et al., 2012 would be useful, as the word "still" is used, and that publication came out almost a decade ago.	This paragraph has been removed due to space constraints.	Bianca Wernecke	South African Medical Research	South Africa
50863	32	5	32	6	What about the minimalist approach that is gaining traction amongst the most wealthy? That most certainly does not constitute the status quo or include the majority of the world's population, but it is nonetheless relevant that the link between overconsumption and individual happiness/well-being is being increasingly questioned.	Deleted this paragraph but discuss wellbeing and consumption in other paragraphs.	Bianca Wernecke	South African Medical Research	South Africa
50865	32	6	32	10	This sentence is difficult to understand. Something is missing?	Deleted this paragraph due to space constraints.	Bianca Wernecke	South African Medical Research	South Africa
22743	32	7	32	8	We suggest to add environmental externalities, non-market activities (such as working at home or informal economy) and the value of public services are also neglected with GDP. to the sentence "However GDP... (Ward et al. 2016)".	Deleted this paragraph due to space constraints.	Government of France	Ministère de la Transition écon	France
80911	32	8	32	8	missing "and" before "therefore" (?)	Thank you	Heinz Wittenbrink	FH Joanneum University of Applied	Austria
5159	32	10	32	14	"Since the traditional approach is based on the neoclassical K L (Solow-Swan) growth model, which considers the effects of merely the capital and the labour on the economic growth, the current empirical growth literature has recently addressed the role of human capital (skills) and institutional quality (Dasgupta et al. 2015; Sugiawan et al. 2019)." COMMENT: This is only partly correct, the work on production functions / growth models has not just focussed on quality-adjusted capital and labour, it has also focussed on including energy's role in economic growth. REF 1: Keen S, Ayres RU, Standish R. A Note on the Role of Energy in Production. Ecol Econ. 2019;157:40–6. ; REF 2: 1. Santos J, Domingos T, Sousa T, St. Aubyn M. Useful Exergy Is Key in Obtaining Plausible Aggregate Production Functions and Recognizing the Role of Energy in Economic Growth: Portugal 1960–2009. Ecol Econ. 2018;148(January):103–20. REF #3: 1. Sakai M, Brockway PE, Barrett JR, Taylor PG. Thermodynamic Efficiency Gains and their Role as a Key 'Engine of Economic Growth.' Energies. 2019;12(110):1–14.	Deleted this paragraph due to space constraints but the Historic Index of Human Development was used in the graph and results discussed.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
14461	32	16	32	16	It's great to talk about these differing indices. However, the reasons why "finding a single measure represents a challenge" are down to much more than lack of data.	Deleted this paragraph due to space constraints but the Historic Index of Human Development was used in the graph and results discussed.	Joanna Depledge	Centre for Environment, Energy	United Kingdom (of Great Britain and Northern Ireland)
22745	32	16	32	17	concerning the sentence "in that sense... (Sugiawan et al. 2019): it is not only because of a lack of data that it is difficult to find a single measure, it is also because it is multidimensional and it is difficult to sum up all the dimensions in a single measure.	Deleted this paragraph due to space constraints but the Historic Index of Human Development was used in the graph and results discussed.	Government of France	Ministère de la Transition écon	France
20139	32	20	32	29	Equity principles, grandfathering in burden sharing, and criticisms also discussed in: - Du Pont, Y. R., & Meinshausen, M. (2018). Warming assessment of the bottom-up Paris Agreement emissions pledges. Nature communications, 9(1), 4810. - Rogelj, J., & Schuessner, C. F. (2019). Unintentional unfairness when applying new greenhouse gas emissions metrics at country level. Environmental Research Letters, 14(11), 114039.	The text has been edited with sentences consolidated and these references don't fit quite as well as they would otherwise have.	Nikas Alexandros	National Technical University of Athens	Greece
2985	32	23	32	23	The inclusion of Najam 2005 to argue for initiatives reaching forward from 2021 seems problematic since the architecture of climate governance, sustainability goals, definitions of sustainable development etc have all evolved considerably since 2005.	This has been removed thank you	Beth Edmondson	Federation University	Australia
12889	32	25	32	25	2014; Robiou Du Pont et al. 2017). Use single name for one author in text	Thank you - Edited this	Amanullah Amanullah	Department of Agronomy, The University of Agriculture	Pakistan
27545	32	25	32	27	Delete "This is more so important as the diminishing carbon budget has intensified debates on which countries should be prioritised to access the remaining carbon budget (McGlade and Ekins 2015; Raupach et al. 2014)."	The sentence has been edited and incorporated with other text. Note: The comment does not provide any justification or reasons for the suggestion to delete the sentence.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
66755	32	25	32	25	A new paper may be salient here: Dooley et al "Ethical choices behind quantification of fair contributions under the Paris Agreement" Nature Climate Change	The reference is salient and is included.	Navroz Dubash	Centre for Policy Research	India
22747	32	28	32	29	We recommend the removal of "Moreover, concerns... Weikmans and Roberts 2019" it doesn't make sense to put it in the paragraph related to equity issues and to the eradication of poverty.	The sentence has been edited and removed.	Government of France	Ministère de la Transition écon	France
4375	32	31	32	31	Add Resilience Approaches and pathways	Rejected. This is not necessary.	Alka Bharat	Maulana Azad National Institute of Technology	India

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50565	32	31	45	25	Section 1.5 could be linked more clearly with the rest of the report, with more forward references to the chapters in each subsection. Some subsections, like 1.5.3 or 1.5.9, have many forward references, but other subsections like 1.5.5 or 1.5.7 have much less. The introduction of 1.5, as it is written, could be a conclusion. The introduction to 1.5 could provide more insight about how these 10 "most important drivers and dynamics" have been chosen, as key to the whole the WGIII assessment.	We strongly encouraged our section LAs to refer forward to other chapters and believe we have now much improved this	Anne Marie Treguier	CNRS	France
22749	32	35	32	36	The enabling conditions are also presented in figure 1.4. This should be added in the sentence: "AR 5 introduced six "enabling conditions" for shifting development pathways which are presented in Chapter 4 of this report..."	Added, thank you	Government of France	Ministère de la Transition éc	France
70265	32	40		46	Doesn't this just mean that enabling conditions are not enough? What is equally needed are political will and action within historically narrow windows of opportunity	Noted	Philippe Tulkens	European Union (EU) - DG Re	Belgium
80369	32	44	32	45	"For example, finance and investments can serve as a barrier or an enabler to climate action." A reference could added that examines precisely this problem: Battiston, S., Monasterolo, I., Riahi, K., & van Ruijven, B. (2020). Climate mitigation pathways need to account for the ambivalent role of finance. Ssrn 3748041.	Interesting! Noted.	Stefano Battiston	University of Zurich	Switzerland
4377	33	1	33	1	pt. 1.5.1, Add Biodiversity and Ecosystem services	Good idea. Added as recommended	Alka Bharat	Maulana Azad National Instit	India
70267	33	1	33	48	The ocean/aquatic dimension is missing from the nexuses, unless the 'water' includes it.	The point is well taken. We now call out oceans explicitly as an example of a nexus, the ocean-land nexus.	Philippe Tulkens	European Union (EU) - DG Re	Belgium
50567	33	7	33	7	I suppose chapter 2 gives an assessment of emissions? It seems better to use "assessment" in this sentence rather than "discussion"?	Thank you, the sentence has been edited.	Anne Marie Treguier	CNRS	France
22751	33	9	33	9	We suggest to add "functionings to the term "needs and desires" :	Thank you, we have edited the sentence: Human societies and individuals value a wide range of services for satisfying their needs and desires for human functioning, ranging from nutrition to shelter to health to mobility and so forth	Government of France	Ministère de la Transition éc	France
8969	33	11	33	14	This sentence is questionable, at least in the way it is expressed. The transgenerational aspect of the definition of both "sustainability" and "sustainable development" (as expressed by the respective definitions by Lester Brown and the Brundtland report) is neglected, while it should be the core of the issue. Here it seems that what humanity should do is to pursue development while trying to keep into account whatever bad may happen to our resource storage, as it seems to be considered the role of the Earth system, that is addressed solely as the provider of further development.	Thank you, we have edited the sentence: Meeting sustainable development goals, including addressing climate change, primarily entails finding ways to provide the goods and, services, and overall quality of lifethat are desired by human populations while protecting the Earth systems that enable sustainable development for not only present generations but also future generations.	Francesco Gonella	Ca' Foscari University of Ven	Italy
65985	33	12	33	13	please provide evidence that SDGs are about the quality of life desired by humans and not by the one needed	Thank you, we have edited the sentence: Meeting sustainable development goals, including addressing climate change, primarily entails finding ways to provide the goods and, services, and overall quality of lifethat are desired by human populations while protecting the Earth systems that enable sustainable development for not only present generations but also future generations.	Yamina Saheb	OpenExp	France
10507	33	14	33	16	Checking abstracts by van Vuuren et al. and van der Berg et al., I do not find any indication that they demonstrate that shifting diet to a more vegetarian balance does not deteriorate the quality of life. Obviously, for many people, to refrain from eating meat will deteriorate the quality of life. Is there any purpose in denying this ? While these people will have to accept it, the possible unpleasant side of the diet shift should not be hidden.	Thank you, agreed. The sentence has been edited and a new reference added: Behaviour changes in relation sectors such as transport (Steg and Gifford 2005) , and changes in the composition of goods consumed, such as, shifting diet toward a more vegetarian balance, can reduce land-use emissions and influence the quality of life (Stehfest et al. 2009; van Vuuren et al. 2018; van den Berg et al. 2019; Hargreaves et al. 2021; Gough 2017). Reference: https://www.mdpi.com/1660-4601/18/8/4067	Philippe Waldteufel	CNRS	France
86749	33	14	33	16	We suggest to add an example of other behavioural change concerning other sector as transport, circular economy, energy, etc. to ensure the balance.	Thank you, we have edited the sentence: Behaviour changes in relation sectors such as transport (Steg and Gifford 2005) , and changingchanges in the composition of goods consumed, for examplesuch as, shifting diet toward a more vegetarian balance, can reduce land-use emissions without comprising and influence the quality of life (Stehfest et al. 2009; van Vuuren et al. 2018; van den Berg et al. 2019; Hargreaves et al. 2021).	Government of Argentina	Ministry of Environment and	Argentina
4727	33	16	33	16	See also "Recomposing consumption: defining necessities for sustainable and equitable well-being" 2017 by Ian Gough.	Thank you, reference added	Julia Steinberger	University of Lausanne	Switzerland
10505	33	16	33	16	Possibly you mean "compromising" rather than "comprising" ?	Thank you, edited.	Philippe Waldteufel	CNRS	France
5193	33	17	33	18	I strongly recommend to modify the sentence "... will require transforming the existing energy institutions that have been largely shaped around fossil fuels towards renewable energy", and replace it by: "will require transforming energy institutions and remodeling public opinion in order to accept a move from fossil fuels toward renewable (hydro, wind, solar and geothermal) and nuclear energy. "	Thank you, we have edited the sentence as follows: In the same vein, addressing climate change will require transforming energy institutions and remodeling public opinion in order to accept a move from fossil fuels toward low-carbon energy system.	Michel SIMON	Retraité/ Pdt d'association	France
61601	33	17	33	18	"In the same vein, addressing climate change will require transforming the existing energy institutions that have been largely shaped around fossil fuels towards renewable energy." Please replace "renewable energy" with the much more accurate and scientifically coherent "low carbon energy system". See more on the problems of the term "Renewable energy" and why "low carbon" should be used instead from Harjanne and Korhonen, 2018, https://doi.org/10.1016/j.enpol.2018.12.029	Thank you, we have edited the sentence as follows: In the same vein, addressing climate change will require transforming energy institutions and remodeling public opinion in order to accept a move from fossil fuels toward low-carbon energy system.	Rauli Partanen	Think Atom	Finland
65639	33	17	33	18	"In the same vein, addressing climate change will require transforming the existing energy institutions that have been largely shaped around fossil fuels towards renewable energy." The target is a low-carbon energy system. Replace "towards renewable energy" either with "towards low-carbon energy" or "towards nuclear and renewable energy".	Thank you, we have edited the sentence as follows: In the same vein, addressing climate change will require transforming energy institutions and remodeling public opinion in order to accept a move from fossil fuels toward low-carbon energy system.	Eero Hirvijoki	Aalto University	Finland
77179	33	17	33	18	To state that "addressing climate change will require transforming the existing energy institutions that have been largely shaped around fossil fuels towards renewable energy" biases the conclusions of the report, completely excluding other non-GHG-emitting sources, like nuclear. A more fair rephrasing should be considered.	Thank you, we have edited the sentence as follows: In the same vein, addressing climate change will require transforming energy institutions and remodeling public opinion in order to accept a move from fossil fuels toward low-carbon energy system.	Giacomo Grasso	ENEA	Italy
45697	33	20	33	20	After Mori et al. 2017, please include a reference to the IPBES Global Assessment (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Diaz, J. Settele, E. S. Brondizio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneeth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichij, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.). IPBES secretariat, Bonn, Germany. 56 pages. https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf	Thank you, reference added.	Government of Germany	Federal Ministry for the Envir	Germany

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22753	33	23	33	23	The statement "The co-evolution of energy, water, land and economy is" would need clarification, the issue of sustainable mobilization of resources, energy, food/agriculture, multipurpose land, etc... is a major issue.	We have edited the sentence as follows: The co-evolution of energy, water, land and economy are key contributors to human well-being, and the inter-connectedness of these sectors is sometimes referred to as the "nexus"	Government of France	Ministère de la Transition é	France
8971	33	26	33	27	This definition of nexus is incompatible with the systemic reality of a complex system: the concept of assessing trade-offs between the various cited dimensions should be replaced by the search for effective systemic leverage points, a concept that -in the context of sustainability assessment- is somewhat incompatible with that of trade-off. In general, trying to identify some sort of "systemic approach" while using trade-offs at various levels is a profoundly dangerous mindset, in as much it represents a misunderstanding of what science intends by "systemic analysis".	As part of text editing to shorten the text to keep within word limits, this sentence has been removed.	Francesco Gonella	Ca' Foscari University of Veni	Italy
22755	33	28	33	29	Concerning the statement "services, such as energy, agriculture and land use and ecosystem services," we recommend to add some example of ecosystem services.	As part of text editing to shorten the text to keep within word limits, this sentence has been edited as follows: Energy, water, land and economy are key contributors to human well-being, and the inter-connectedness of these sectors is sometimes referred to as the "nexus" (Bazilian et al. 2011; Ringler et al. 2013; Smaijl et al. 2016; Albrecht et al. 2018; D'Odorico et al. 2018; Van Vuuren et al. 2019; Energy 2014), which is particularly important in the context of provision of ecosystem services (provisioning, regulating, supporting and cultural services).	Government of France	Ministère de la Transition é	France
84509	33	28	34	12	The role of cities in providing new systems of transformation as well as the emphasis on urban planning may be given referral to Chapter 8 for consistency. Additional representation of Chapter 8 will be useful.	We have added a reference to Chapter 8. We were unable to expand on the discussion on cities due to word limit constraints.	Silir KILKIS	The Scientific and Technologi	Turkey
48625	33	31	33	32	unclear about 'ie' for economic activities as energy provides more than just economic services, should this be 'eg'?	Yes, it should be e.g. - edited	Lorraine Elliott	The Australian National Unive	Australia
72387	33	32	33	32	To illustrate and operationalize the basic role of energy in civilization (and mitigation), add for example: "An energy perspective can help us understand human activity more accurately. We can see societies and civilizations as biophysical systems that transfer energy in trophic (or food) chains across different trophic levels. A socio-economic system can be represented as an ecosystem where different trophic levels participate in the degradation, or dissipation, of the thermodynamic potential associated with the highest-potential stock (or lowest trophic level). For civilizations, the lowest trophic level is defined as natural resources, e.g. fossil fuels in the case of the modern civilization. Fossil fuels have a high thermodynamic potential, which can be dissipated in the form of the heat when the carbon and the hydrogen contained in the fuels react with atmospheric oxygen. The resulting cascade of trophic levels corresponds to different elements of the economic system: the extractive industry, the manufacturing industry, the bureaucracy, and finally pollution (or waste) as the end result of the economic process (Bardi et al. 2019)." Alternatively, for a thermodynamic view of civilization and relevant sectors, compare also e.g. Garrett 2012, Garrett et al. 2020.	Thank you for your comment. Due to strict world limits, we were only able to add a reference to this, and were unable to expand on it: see (Garrett et al. 2020) for thermodynamic considerations	Paul Maidowski	Fletcher School, Tufts; indepe	Germany
72391	33	32	33	32	Add reference: Bardi, Ugo, Sara Falsini, and Ilaria Perissi. 2019. "Toward a General Theory of Societal Collapse: A Biophysical Examination of Tainter's Model of the Diminishing Returns of Complexity." <i>BioPhysical Economics and Resource Quality</i> 4(1): 3. http://dx.doi.org/10.1007/s41247-018-0049-0 .	Added, thank you	Paul Maidowski	Fletcher School, Tufts; indepe	Germany
48627	33	33		35	the range of 'services' described here are also central to human and personal security and safety	Thank you, we have added the following: and other services that are central to human and personal security and safety	Lorraine Elliott	The Australian National Unive	Australia
10509	33	39	33	39	"increase" rather than "increasing"	Fixed, thank you	Philippe Waldteufel	CNRS	France
4729	33	41	33	42	See Millward-Hopkins et al 2020 on a service-based global scenario for satisfying well-being.	Thank you, we have added this	Julia Steinberger	University of Lausanne	Switzerland
22757	33	44	33	46	The reason why the EROI will decrease in the future for fossil fuels should be added in the sentence "In terms of energy-return-on-investment, the ratios for fossil fuels are now much closer to those of renewables, and are expected to decline for the former in the future (Brockway et al. 2019)."	thank you. we have added the reference and the EROI concept.	Government of France	Ministère de la Transition é	France
61603	33	44	33	46	Renewable energy EROI varies significantly depending on what source is in question, and mostly wind, solar and hydro have been improving, while especially bio-crops often remain low. Further, nuclear energy has both the highest EROI of low carbon energy sources by far and the potential to grow by an order of magnitude further by deploying technologies like breeder reactors. See (Weissbach et al., 2013, https://doi.org/10.1016/j.energy.2013.01.029) and Table 2 in https://www.world-nuclear.org/information-library/energy-and-the-environment/energy-return-on-investment.aspx . Nuclear should be mentioned here also because it is currently the only low carbon energy source that can be used to synthesize e-fuels which will – even after all the conversion losses – still have an EROI of well above the 11:1 limit that Fizaine and Court estimated as the minimum for a growing economy such as the US, see https://doi.org/10.1016/j.enpol.2016.04.039	thank you for this comment. The level of detail here is beyond the scope of Chapter 1, but has been forwarded to the energy chapter.	Rauli Partanen	Think Atom	Finland
65641	33	44	33	46	"In terms of energy-return-on-investment, the ratios for fossil fuels are now much closer to those of renewables, and are expected to decline for the former in the future (Brockway et al. 2019)." If renewables are mentioned explicitly in this context, then it would be only fair to mention that nuclear energy performs even better than either of the fossil or variable renewable sources. For a references, see (Weissbach et al., 2013, https://doi.org/10.1016/j.energy.2013.01.029), and Table 2 in https://www.world-nuclear.org/information-library/energy-and-the-environment/energy-return-on-investment.aspx for additional ones. Modify the text accordingly.	citation has been added and the point broadened beyond renewables alone. However, we also note that EROI in only one determinant shaping a decarbonization technology portfolio.	Eero Hirvijoki	Aalto University	Finland
72393	33	44	33	46	Would it help to explain the significance of EROI (add abbreviation in line 44) more fully here or later? Add sentence (line 46) "This decrease in EROI can raise systemic risk. Conceptual questions about the trajectory of complex systems, understood as dissipative structures whose metabolism is partly based on finite or slowly renewable resources. It heightens the need to conduct interdisciplinary analysis grounded in energy and biophysical constraints in diverse contexts, potentially starting with models rooted in the simple concept of trophic chains."	The financial aspects and systemic risk are explained in section 4.4 on finance.	Paul Maidowski	Fletcher School, Tufts; indepe	Germany
72395	33	44	33	46	Add an EROI graphic, or link to one in the relevant chapter (e.g. S)?	This material is to be detailed for chapter 1 and belongs in the energy chapter. we will forward it to that chapter.	Paul Maidowski	Fletcher School, Tufts; indepe	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
72397	33	44	33	46	2 points: 1. Would it be possible to synthesize EROI literature as necessary (incl. Garrett 2012a, 2012b, Garrett et al. 2020) and literature on energy or thermodynamic literature? It could help to add a fundamental argument, the alleged (and empirically testable) link between the time integral of world economic production and primary energy consumption. Including these broader links between energy dissipation, GHG emissions, and overshoot and collapse dynamics (LTG; Meadows 1972, 2004) could help sharpen readers' focus on the critical problems to be addressed in climate mitigation and sustainability. 2. Add: Garrett, Timothy J. 2012. "Modes of Growth in Dynamic Systems." Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences 468(2145): 2532–49. Garrett, Timothy J. 2012. "No Way out? The Double-Bind in Seeking Global Prosperity alongside Mitigated Climate Change." Earth System Dynamics 3(1): 1–17. 10.5194/esd-3-1-2012.	This material is too detailed for chapter 1 and belongs in the energy chapter. we will forward it to that chapter.	Paul Maidowski	Fletcher School, Tufts; indepe	Germany
72433	33	44	33	44	The term "Energy return on investment" (EROI) should be defined either here or in Annex-A or -B	we have defined it and added a reference.	Sylvain Pichat	University of Lyon, Ecole nor	Germany
45699	34	1	34	6	When introducing the term nature-based solutions it would be appropriate to point out the central role biodiversity plays for NBS. If the term is excluded, readers might not think of biodiversity when "ecosystem services for sustainable development" are described. Please refer to additional literature on Nbs: Seddon et al. 2021, Cohen-Shacham et al. 2016, Cohen-Shacham et al. 2019.	Agreed. Biodiversity is now explicitly included.	Government of Germany	Federal Ministry for the Envir	Germany
51949	34	1	34	1	"others" should be "other"	Thank you	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
70269	34	1	34	6	Aquatic dimension is missing.	A reference to aquatic systems has been added.	Philippe Tulkens	European Union (EU) - DG Re	Belgium
79903	34	1	34	6	Suggest to make especial reference to Wildfires Forest as elaborated in chapter 7	This is a level of detail that is beyond the scope of Chapter 1.	Carlos Ruiz Garvia	UNFCCC	Panama
22759	34	5	34	5	"enhancing ecosystem services for sustainable development": it would help understand to have one or two example of ecosystem services.	This has been done. Ecosystem services are broken down into provisioning, regulatory, and cultural, with an example for each.	Government of France	Ministère de la Transition éc	France
9043	34	6	34	6	Add the following reference and introduce also the development of a Global Standard for the application of Nature Based Solutions provided by the IUCN. "IUCN (2020). Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of Nbs. First edition. Gland, Switzerland: IUCN."	Rejected. This is outside the scope of Chapter 1.	Emmanuel Garbolino	Climpact Data Science	France
2987	34	7	34	7	should read '...between patterns of....'	Thank you	Beth Edmondson	Federation University	Australia
9841	34	7		17	Typo: patters	Thank you	Government of Indonesia	Ministry of Environment and	Indonesia
10511	34	7	34	7	patters : you mean "patterns"?	Thank you	Philippe Waldteufel	CNRS	France
54561	34	7	34	7	"patters" should be "patterns".	Thank you	Government of United States of America	U.S. Department of State	United States of America
22761	34	3	34	6	In the sentence "Here the role of urban... (Newman et al. 2017)", what the purposeful "experimentation" we suggest to specify what the purposeful "experimentation" and what the regeneration of the atmosphere through CDR technologies refer to	Agree with the reviewer. This sentence is unclear--particularly the reference to CDR.. Amended	Government of France	Ministère de la Transition éc	France
51951	34	10	34	14	The sentence not clear.	Agree with the reviewer. This sentence is unclear--particularly the reference to CDR.. Amended	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
25097	34	11	34	11	Can we say CDR technologies help regenerate the atmosphere?	Agree with the reviewer. This sentence is unclear--particularly the reference to CDR.. Amended	Minal Pathak	WGIII TSU, Ahmedabad Unive	India
70271	34	17	35	24	It is worth mentioning that the Paris Agreement itself is a response to some of the trade-related phenomena mentioned in this section. While recognising the issues pointed out in this section, remember what the PA provides compared to the pre-2015 situation. 1) a global Agreement covering almost all anthropogenic emissions; 2) a requirement for all countries to produce and maintain a GHG emissions inventory; 3) rules on accounting and avoidance of double counting. Therefore, making sure that these Paris processes work well in practice is an important first step towards addressing the consumption/ trade issues recognised here. This should not go unmentioned. We are not starting from scratch.	Due to strict word count limits, we have included a mention of the PA in the last paragraph of this section	Philippe Tulkens	European Union (EU) - DG Re	Belgium
86829	34	17	34	19	With regards to the section "1.5.2 Trade, consumption and leakage", and the reference that "Emissions associated with the production of internationally traded goods and services account for 20-33 % of global emissions (Wiedmann and Lenzen 2018)", we suggest deleting this sentence as its figures are based on secondary sources, and not on IPCC/UNFCCC figures. It is unclear the methodology used to reach these facts, which could be misleading and penalize international trade, when trade is an important engine of growth, development, poverty eradication and innovation, even more in the context of the post-pandemic economic recovery.	We have added a note to say that this estimate is based on multi-regional input-output analysis	Government of Argentina	Ministry of Environment and	Argentina
5057	34	18	34	19	A span of 20 to 33% is large. If possible, add at least a second source in addition to Wiedmann & Lenzen (2018).	20-33% is the best estimate we have got	Lina Hollender	n/a	Germany
5059	34	18	34	22	It might be worth mentioning the COVID-19 pandemic in this context. Many other chapters do so. We have seen changing patterns of demand and consumption (think of flights and other travel), some of which may sustain. You may at least want to acknowledge this possibility here.	COVID 19 is not relevant here. There is a Box Article on it.	Lina Hollender	n/a	Germany
22763	34	18	34	19	concerning the sentence "Emissions associated... (Wiedmann and Lenzen 2018)", what is included in the 20-33% of global emissions induced by internationally traded goods? Is it only transport or also the energy systems in the countris where goods are produced? This should be presised.	20-33% also covers emissions from energy systems in countries where goods are produced	Government of France	Ministère de la Transition éc	France
70273	34	18		33	Don't forget rebound effects potentially offsetting mitigation outcomes	Noted	Philippe Tulkens	European Union (EU) - DG Re	Belgium
79969	34	18	35	24	Although it discusses relevant literature, the section on trade is difficult to follow, editorially. Should not the 'big message' coming out from this sub-section be that a significant proportion of countries are 'outsourcing' their emissions? This message gets buried in the text; I suggest that after page 34, line 18-19, the next portion of text should be the portion currently on page 35, lines 3-15 (ie, move it up to middle of page 34). The term 'carbon leakage', while it may be referenced, has the tendency to overwhelm this section and reads rather as a euphemism for the fact that many countries have shifted their energy/emissions heavy industries elsewhere and now import those emissions via embedded carbon, but the emissions are not counted against their national emissions figures (which are production-based only). This could be very much clarified in the text. I recommend very much that you reference Aarathi Krishnan and Simon Maxwell's (2020) report: Counting Carbon in Global Trade. London: ODI. https://www.odi.org/sites/odi.org.uk/files/resource-documents/200604_counting_carbon_web.pdf	Seperated paragraph on carbon leakage	Mairi Dupar	Overseas Development Instit	United Kingdom (of Great Britain and Northern Ireland)
28705	34	22	34	24	Tariff reduction of low carbon technologies. This should read tariff reduction of low carbon goods and services, because technologies are imbedded in such goods and services on which tariff is applied. Technology is a content.	Done	louis lubango Mitondo	United Nations	Ethiopia

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
86831	34	23	34	24	With regards to the reference that "Tariff reduction of low carbon technologies could facilitate effective mitigation", this is an issue under discussion in the WTO trade and environment negotiations under paragraph 31. iii of the WTO Doha Declaration. The IPCC should thus avoid prejudging or duplicating the primary debates in the competent fora (WTO). Instead, the phrase could be replaced as follows: "The reduction and removal of tariff and non-tariff barriers to environmental goods and services, as appropriate, are under negotiation in the WTO"	While this issue is under negotiation, so long as there are studies suggesting the benefit of tariff reduction of low carbon goods and services, they are mentioned here	Government of Argentina	Ministry of Environment and	Argentina
28707	34	25	34		What is being described here concerns some factors that promote carbon leakage. The message is unclear and very confusing to the public. This should be rephrased to make it clear that the issue concerns some relationship between carbon pricing (taxes or credits), consumption and production, trade and emission patterns....The concept of carbon pricing should appear explicitly in this message. Please indicate that carbon leakage is viewed here in international production system that is globalized and interlinked. Failed or weak interjurisdictional harmonization of carbon prices (mainly taxes) catalyzes carbon leakages. Huge gaps in carbon taxes between jurisdictions facilitate for carbon leakage. Tax averse firms find it easy to transfer carbon-intensive operations into jurisdictions having lower taxes or no taxes policies, thus leaking out carbon emissions at lowest cost possible. Please also emphasize that harmonizing taxes between jurisdictions is a good solution to curbing carbon leakages and allowing carbon pricing policy to contribute significantly to reduce mitigation plans. The message is biased towards the failure. Solutions should also be indicated. Additional solutions which can be added here or in other paragraphs are the following. 1) Design and operationalization of carbon pricing and trading programmes. Efficient design coupled with other policies can help resolve anticompetitive behavior of firms and enterprises in regional markets, which may also have regressive effects on mitigation plans. 2) Information symmetry about the remaining carbon budget is another issues that need to be addressed in this chapter. Sufficient information helps to determine the % of permissible carbon emission from the remaining carbon budget. It can help address some issues relating to litigations between jurisdictions. 3) A steady carbon price should be sustained by increase of annual floor (auction reserve) price for allowances and reduction of annual allowances budget. 3) Covered entities should meet the compliance obligation by acquiring and surrendering allowances in an amount equivalent to their compliance obligation. 4) Offset must be issued to qualifying emission reduction projects. 5. Secondary market should be promoted to facilitate sale and trade of offset credits among entities participating in the programme	We have added a reference to carbon pricing	louis lubango Mitondo	United Nations	Ethiopia
86833	34	25	34	30	With regards to the affirmation related to "carbon leakage" ("Carbon leakage offsetting the reduction in emissions by an increase outside the jurisdiction could occur through changes in the relative prices, relocation of industry, nested regulation and weak consumption leakage (see Box 5.4. AR5) (Naegele and Zaklan2019). The magnitude of carbon leakage caused by early and unilateral mitigation policies in a fragmented climate policy world depends on trade and substitution patterns of fossil fuels and the design of policies"), it should be clarified that these are views of some literature, but that they have no multilateral consensus. In this regard, we suggest adding the following in block letters: "SOME LITERATURE STATES THAT Carbon leakage offsetting the reduction in emissions by an increase outside the jurisdiction could occur through changes in the relative prices, relocation of industry, nested regulation and weak consumption leakage (see Box 5.4. AR5) (Naegele and Zaklan2019). OTHER AUTHORS SUSTAIN THAT The magnitude of carbon leakage caused by early and unilateral mitigation policies in a fragmented climate policy world depends on trade and substitution patterns of fossil fuels and the design of policies)".	We say "carbon leakage... could occur" not asserting that it always occurs.	Government of Argentina	Ministry of Environment and	Argentina
22765	34	33	34	33	It seems that there is no section 13.2.6. The good section number should be mentioned.	cross-ref corrected	Government of France	Ministère de la Transition éc	France
15199	34	34	34	38	The statement about "carbon leakage and border carbon adjustment (BCA)" in this paragraph is too arbitrary. There is still a controversy on carbon leakage, and whether a BCA can cope with carbon leakage is also controversial. It is suggested to delete this paragraph. The supporting literature is as follows: World Bank. International Trade and Climate Change: Economic, Legal, and Institutional Perspectives. Overview [R]. 2007. Reinaud J. Issues behind Competitiveness and Carbon Leakage [R]. IEA Information Paper, 2008.	The draft is nuanced about carbon leakage and BCAs	Government of China	China Meteorological Admini	China
22767	34	34	34	38	This paragraph about BCA has a quite negative tone, whereas a solid base of literature indicates that BCA could be a promising way to address carbon leakage as countries engage in ambitious climate mitigation efforts. (Mehling, Michael A., et al. "Designing border carbon adjustments for enhanced climate action." American Journal of International Law 113.3 (2019): 433-481.) Without denying the challenges, we suggest to focus the first sentence of the para on its positive side : "There are a number of policy responses to cope with carbon leakage, including BCAs, which have the potential to efficiently address carbon leakage as countries engage in more ambitious climate change mitigation efforts. Yet, BCAs have limitations. Some options could..."	Comments incorporated	Government of France	Ministère de la Transition éc	France
28709	34	34	34	38	Only problems have been highlighted. It would be helpful to also indicate some solutions. E.g. in the maritime transport, efficient definition and regulation of the following can help border adjustment measure to deliver successful outputs. 1) The entities in charge of reporting compliance with emission reduction. 2) Size and weigh thresholds for compulsory participation in the markets. Conventionally good cut-off are 5,000 gross tonnage and larger, as ships having above 5,000 gross tonnage release 85% of the global maritime GHG [(https://www.imo.org/en/MediaCentre/PressBriefings/Pages/28-MEPC-data-collection--.aspx [Ref: IMO, 2016b. New requirements for international shipping as UN body continues to address green gashouse emissions]. 3) Compliance entity point regulation, which should be downstream of the point of ship operator.	Too much specific comment focusing on one sector	louis lubango Mitondo	United Nations	Ethiopia

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
45737	34	34	34	38	Please replace with: "There could be a number of policy responses to cope with carbon leakage. One proposal is the introduction of carbon border adjustments. Some border adjustment proposals focus on levelling the cost of carbon paid by consumers on products (Ismer et al. 2016) and can be designed in line with WTO law. Other proposals focus on levelling the costs of Emission Trading Schemes at the border (e.g. Mehling et al. 2019) and could potentially be incompatible with WTO law. All border adjustment proposals have limitations with regard to instant and WTO-consistent feasibility or climate effectiveness. One major problem for all proposals is the difficulty of tracing and verifying the carbon content of inputs. An international consensus and certification practice on the carbon content of products would help to overcome WTO restrictions, especially the problem of differentiating between different process and production methods (Holzer 2014, p. 97 f.). COMMENT: The original text is too unspecific, not revealing the policy relevant information. Why are only the WTO-inconsistent approaches explicitly mentioned? LITERATURE: Kateryna Holzer, Carbon-Related Border Adjustment and WTO Law, Edward Elgar 2014; Ismer, R., Haussner, M., Neuhoff, K., & Acworth, W. W.: Inclusion of Consumption into Emissions Trading Systems: Legal Design and Practical Administration, DIW Discussion Paper 1579, Download: https://www.diw.de/documents/publikationen/73/diw_01.c.534388.de/dp1579.pdf .	Comments incorporated	Government of Germany	Federal Ministry for the Environment	Germany
48159	34	34	34	38	"Some options could potentially be incompatible with WTO, particularly those not focused on simply levelling the cost of carbon paid by consumers", it is recommended to add the latest literature support. Supporting documents: Lei Zhu, Lianbiao Cui, Joachim Schleich. 2020. Designing a globally acceptable carbon tax scheme to address competitiveness and leakage concerns. Climate Change Economics, Vol. 11, No. 2 (2020) 2050008	Reference added	Yang Wang	Beijing Climate Center	China
72435	34	35	34	36	"Some options could potentially be incompatible with WTO, particularly those not focused on simply levelling the cost of carbon paid by consumers" I do not understand this sentence. The present IPCC report discuss options that should lead to decrease of GHG emissions/reaching SDGs. Why not considering changes in WTO rules as these comes from an agreement between WTO members? So these "options" may not be compatible with the present rules of WTO but these could be amended if they go in the direction of achieving the SDGs.	IPCC report itself is not in a position to advocate amendment of WTO rules.	Sylvain Pichat	University of Lyon, Ecole normale	Germany
45739	34	38	34	38	Mehling seems not the most relevant author for WTO law in the context of the Paris Agreement. Instead the book from Kateryna Holzer could be mentioned as the relevant source of information. Kateryna Holzer: Carbon-Related Border Adjustment and WTO Law, Edward Elgar 2014, https://www.elgar.com/shop/gbp/carbon-related-border-adjustment-and-wto-law-9781782549987.html .	Reference added	Government of Germany	Federal Ministry for the Environment	Germany
70275	34	39	35	2	In light of the previous discussion on sustainable development, addressing other factors besides energy and carbon embedded in trade would be important --> eg virtual water	Thank you for your comment. We have added the following text: "[...], and other environmental impacts such as virtual water, land-use, and social impacts "	Philippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
2989	34	40	34	42	Merely stated that "... inventories report territorial emissions" does not articulate whether, why, in what ways this might be problematic, create tensions and so on. Worth adding brief elaboration.	Thank you for your comments. We have edited the text as follows: "Official inventories report territorial emissions, which do not consider the impacts embodied in imports of goods and services. In recent years, other methods have been suggested as a way of accounting for emissions associated with international trade"	Beth Edmondson	Federation University	Australia
48629	34	43			energy not "exergy"?	Thank you for your comments. It is actually "exergy", as mentioned in the title of the paper as well: "Exergy-Based Responsibility Allocation of Climate Change"	Lorraine Elliott	The Australian National University	Australia
78285	34	43	34	43	"exergy-based responsibility will mystify many!"	Thank you for your comments. We have added the following text in the revised version: "exergy-based responsibility based on thermodynamics "	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
12891	34	46	34	46	(Afionis et al. (2017); write as (Afionis et al., 2017); remove bracket here	Thank you, this has been corrected,	Amanullah Amanullah	Department of Agronomy, University of Agriculture Faisalabad	Pakistan
12893	35	8	35	8	İlâki Arto and Erik Dietzenbacher 2014), give single name for one author	Thank you, this has been corrected.	Amanullah Amanullah	Department of Agronomy, University of Agriculture Faisalabad	Pakistan
28479	35	16	35	20	The text mentions shares of 1.5% for aviation and 2.6% for shipping in total CO2. The aviation share seems to be expressed in terms of total GHG emissions, not CO2, given the numbers in Figure 1.2 (58 Gt of GHG in 2018) and the 1 Gt available from the IEA (https://www.iea.org/reports/aviation). IEA also reports 33.5 Gt of CO2 from fuel combustion (https://www.iea.org/reports/co2-emissions-from-fuel-combustion-overview) and refers to a 2.8% share of aviation in the total (https://www.iea.org/reports/aviation) of all CO2 emissions from fuel combustion. International shipping accounts for 0.7 Gt CO2 from fuel combustion according to the IEA (https://www.iea.org/reports/international-shipping). Domestic shipping is likely in the ballpark of 0.2 Gt (see figure 13 here: https://euagenda.eu/upload/publications/untitled-110953-ea.pdf , data from the IEA). This gives a total for navigation that is very similar to the total for aviation, and eventually slightly lower. But the share attributed to shipping in the text (2.6%) is significantly higher. Using the IMO estimates also indicates a similar figure (1 Gt to 1.1 Gt) See https://imoarcticsummit.org/wp-content/uploads/2020/09/MEPC-75-7-15-Fourth-IMO-GHG-Study-2020-Final-report-Secretariat.pdf . To me, this means that the % given for shipping should be revised/double checked. If effects of short lived pollutants are included (maybe this is the reason for the 2.6%), I think that there is merit in giving a better explanation, since aviation - once indirect effects are accounted for - is likely to weight more than shipping, while the numbers given here point readers in another direction. Note also that shipping and aviation are given shares of 3.3% of energy-related GHG emissions in Chapter 6 (page 9, line 29).	Thank you for your comments, well-received. The text has been revised, in accordance with the numbers provided in Chapter 10 - The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, hence emissions from international aviation and shipping are not covered. According to 2018 data (not considering the effects of COVID-19), aviation is responsible for approximately 2.4% of total anthropogenic emissions of carbon dioxide, including land-use change, and shipping emits 2.9% of global anthropogenic carbon dioxide emissions (see Chapter 10 for a detailed discussion, with data on historical and current emissions from these sectors, including accountability and governance). In addition to carbon dioxide emissions, aircraft-produced contrail cirrus clouds and emissions of black carbon and short-lived aerosols (e.g. sulphates) from shipping are especially harmful for the Arctic (Qian et al. 2015; Ramanathan and Xu 2010; Stephenson et al. 2018; Pistone et al. 2019; Schaefer et al. 2014; Steffen et al. 2018; Lenton et al. 2019a; Kärcher 2018) (chapter 10).	Pierpaolo Cazzola	International Transport Forum	France

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51579	35	16	35	17	Figure 2.8 found p. 2-34 doesn't seem to support the statement "Emissions from aviation and shipping are only considered in production-based accounting approaches, and not territorial and consumption-based approaches"	Thank you for your comment. The text has been revised, in accordance with the information and numbers provided in Chapter 10 - The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, hence emissions from international aviation and shipping are not covered. According to 2018 data (not considering the effects of COVID-19), aviation is responsible for approximately 2.4% of total anthropogenic emissions of carbon dioxide, including land-use change, and shipping emits 2.9% of global anthropogenic carbon dioxide emissions (see Chapter 10 for a detailed discussion, with data on historical and current emissions from these sectors, including accountability and governance). In addition to carbon dioxide emissions, aircraft-produced contrail cirrus clouds and emissions of black carbon and short-lived aerosols (e.g. sulphates) from shipping are especially harmful for the Arctic (Qian et al. 2015; Ramanathan and Xu 2010; Stephenson et al. 2018; Pistone et al. 2019; Schaefer et al. 2014; Steffen et al. 2018; Lenton et al. 2019a; Kärcher 2018) (chapter 10).	eric lombard	Stay Grounded	France
51581	35	16	35	18	Aviation emits more than 1.6% of global CO2. Chapter 10.5.1 indicates that "aviation is responsible for approximately 2.4% of total anthropogenic emissions of CO2, including land use change, on an annual basis" (p. 10-60 Line 9)	Thank you for your comment. The text has been revised, in accordance with the information and numbers provided in Chapter 10 - The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, hence emissions from international aviation and shipping are not covered. According to 2018 data (not considering the effects of COVID-19), aviation is responsible for approximately 2.4% of total anthropogenic emissions of carbon dioxide, including land-use change, and shipping emits 2.9% of global anthropogenic carbon dioxide emissions (see Chapter 10 for a detailed discussion, with data on historical and current emissions from these sectors, including accountability and governance). In addition to carbon dioxide emissions, aircraft-produced contrail cirrus clouds and emissions of black carbon and short-lived aerosols (e.g. sulphates) from shipping are especially harmful for the Arctic (Qian et al. 2015; Ramanathan and Xu 2010; Stephenson et al. 2018; Pistone et al. 2019; Schaefer et al. 2014; Steffen et al. 2018; Lenton et al. 2019a; Kärcher 2018) (chapter 10).	eric lombard	Stay Grounded	France
69895	35	16	35	20	Emissions of aviation are 9822 MtCO2 that is 2.4% of energy related CO2 emissions. This is explicit in Chapter 10, p.60, 1.9 (which reads 2.4% of total anthropogenic CO2 emissions including land use change). Shipping is responsible ~1000 MtCO2, that is, about 2.9% of total total energy related CO2 emissions. I suspect the confusion may come from the larger role of domestic aviation emissions (35 - 40% of total) vs. that of domestic maritime emissions (about 15%).	Thank you for your comment. The text has been revised, in accordance with the information and numbers provided in Chapter 10 - The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, hence emissions from international aviation and shipping are not covered. According to 2018 data (not considering the effects of COVID-19), aviation is responsible for approximately 2.4% of total anthropogenic emissions of carbon dioxide, including land-use change, and shipping emits 2.9% of global anthropogenic carbon dioxide emissions (see Chapter 10 for a detailed discussion, with data on historical and current emissions from these sectors, including accountability and governance). In addition to carbon dioxide emissions, aircraft-produced contrail cirrus clouds and emissions of black carbon and short-lived aerosols (e.g. sulphates) from shipping are especially harmful for the Arctic (Qian et al. 2015; Ramanathan and Xu 2010; Stephenson et al. 2018; Pistone et al. 2019; Schaefer et al. 2014; Steffen et al. 2018; Lenton et al. 2019a; Kärcher 2018) (chapter 10).	Cédric PHILIBERT	Institut Français des Relations	France
85355	35	16	35	16	The statement contains no references and a high uncertainty, specifically on the uncertainty of the ranges provided. The relevant research is ongoing and a scientific consensus on the non-CO2 impacts of aviation have not been reached. Please provide the underpinning data and assumptions and refer to the latest Scientific research on this matter, such as Lee et al., 2020, amongst others. This statement should be accompanied by a disclaimer as not considering the impacts of COVID-19. If this is a new IPCC assessment then the assumptions and scientific basis should be clearly provided.	Thank you for your comment. The text has been revised, in accordance with the information and numbers provided in Chapter 10 - The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, hence emissions from international aviation and shipping are not covered. According to 2018 data (not considering the effects of COVID-19), aviation is responsible for approximately 2.4% of total anthropogenic emissions of carbon dioxide, including land-use change, and shipping emits 2.9% of global anthropogenic carbon dioxide emissions (see Chapter 10 for a detailed discussion, with data on historical and current emissions from these sectors, including accountability and governance). In addition to carbon dioxide emissions, aircraft-produced contrail cirrus clouds and emissions of black carbon and short-lived aerosols (e.g. sulphates) from shipping are especially harmful for the Arctic (Qian et al. 2015; Ramanathan and Xu 2010; Stephenson et al. 2018; Pistone et al. 2019; Schaefer et al. 2014; Steffen et al. 2018; Lenton et al. 2019a; Kärcher 2018) (chapter 10).	Neil Dickson	ICAO	Canada
22769	35	18	35	19	A reference justifying the fact that the climate impact of aviation is 2 - 4 times higher than emissions needs to be added. For example : Arrowsmith S., Lee D. S., Owen B., Faber J., van Wijngaarden L., Boucher O., Celikel A., Deransy R., Fuglestedt J., Laukia J., Lund M. T., Sausen R., Schaefer M., Skowron A., Stromatas S. and Watt A. (2020) Updated analysis of the non-CO2 climate impacts of aviation and potential policy measures pursuant to the EU Emissions Trading System Directive Article 30(4). European Union Aviation Safety (EASA). MOVE/E1/SER/2019-475/S12.81706, Köln. https://www.easa.europa.eu/sites/default/files/dfu/201119_report_com_ep_council_updated_analysis_non_co2_climate_impacts_aviation.pdf	Thank you, this reference has been added	Government of France	Ministère de la Transition é	France
14463	35	20	35	21	This is inaccurate. The reason why the PA does not mention shipping and aviation is nothing to do with its focus on NDCs - the PA does not specify what sectors countries should include in their NDCs, and as noted in chapter 14 (p.70), countries could mention aviation/shipping strategies within them. The reasons are much deeper, and are to do with the international division of labour on these sectors, whereby the KP assigned them to their respective sector organisations (ICAO and IMO). Moreover, because of complexities in allocating emissions, these are not included in national totals as part of the IPCC inventory methodologies, but reported separately.	Thank you for your comment. The text has been revised with focus on NDCs removed, and revisions done in accordance with the information and numbers provided in Chapter 10 - The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, hence emissions from international aviation and shipping are not covered. According to 2018 data (not considering the effects of COVID-19), aviation is responsible for approximately 2.4% of total anthropogenic emissions of carbon dioxide, including land-use change, and shipping emits 2.9% of global anthropogenic carbon dioxide emissions (see Chapter 10 for a detailed discussion, with data on historical and current emissions from these sectors, including accountability and governance). In addition to carbon dioxide emissions, aircraft-produced contrail cirrus clouds and emissions of black carbon and short-lived aerosols (e.g. sulphates) from shipping are especially harmful for the Arctic (Qian et al. 2015; Ramanathan and Xu 2010; Stephenson et al. 2018; Pistone et al. 2019; Schaefer et al. 2014; Steffen et al. 2018; Lenton et al. 2019a; Kärcher 2018) (chapter 10).	Joanna Depledge	Centre for Environment, Energy	United Kingdom (of Great Britain and Northern Ireland)

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22771	35	20	35	20	for the statement "As the Paris Agreement primarily deals with NDCs" This is true only so far as NDCs do not usually address international aviation and maritime emissions - but the overall goals of the Paris Agreement for climate neutrality and temperature goals do include aviation and maritime emissions. The reason why emissions from international aviation and shipping are not covered by Pa is not that it deals with NDCs, but the fact that NDCs are to be accounted for based on GHG inventories, which are territorial. Suggestion to rephrase " As under the Paris Agreement, NDCs are to be accounted for based on GHG inventories, which are territorial, ..."	Thank you for your comment. The text has been revised with focus on NDCs removed, and revisions done in accordance with the information and numbers provided in Chapter 10 - The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, hence emissions from international aviation and shipping are not covered. According to 2018 data (not considering the effects of COVID-19), aviation is responsible for approximately 2.4% of total anthropogenic emissions of carbon dioxide, including land-use change, and shipping emits 2.9% of global anthropogenic carbon dioxide emissions (see Chapter 10 for a detailed discussion, with data on historical and current emissions from these sectors, including accountability and governance). In addition to carbon dioxide emissions, aircraft-produced contrail cirrus clouds and emissions of black carbon and short-lived aerosols (e.g. sulphates) from shipping are especially harmful for the Arctic (Qian et al. 2015; Ramanathan and Xu 2010; Stephenson et al. 2018; Pistone et al. 2019; Schaefer et al. 2014; Steffen et al. 2018; Lenton et al. 2019a; Kärcher 2018) (chapter 10).	Government of France	Ministère de la Transition éc	France
85735	35	20	35	20	In this context, it would be more accurate to say "The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, emissions from international aviation and shipping are not covered..."	Thank you for your comment. The text has been revised with focus on NDCs removed, and revisions done in accordance with the information and numbers provided in Chapter 10 - The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, hence emissions from international aviation and shipping are not covered. According to 2018 data (not considering the effects of COVID-19), aviation is responsible for approximately 2.4% of total anthropogenic emissions of carbon dioxide, including land-use change, and shipping emits 2.9% of global anthropogenic carbon dioxide emissions (see Chapter 10 for a detailed discussion, with data on historical and current emissions from these sectors, including accountability and governance). In addition to carbon dioxide emissions, aircraft-produced contrail cirrus clouds and emissions of black carbon and short-lived aerosols (e.g. sulphates) from shipping are especially harmful for the Arctic (Qian et al. 2015; Ramanathan and Xu 2010; Stephenson et al. 2018; Pistone et al. 2019; Schaefer et al. 2014; Steffen et al. 2018; Lenton et al. 2019a; Kärcher 2018) (chapter 10).	Government of Australia	Department of Industry, Scie	Australia
48161	35	21	35	24	Sulfur Oxides and Resulting Sulfate Aerosol: emissions of sulfur oxides and resulting sulfate aerosol are very small, and the increase of sulfate is mostly caused by the chemical formation of sulfur dioxide emissions in the atmosphere. Supporting documents: Stephenson, S. R., W. Wang, C. S. Zender, H. Wang, S. J. Davis, and P. J. Rasch, 2018: Climatic responses to future trans-Arctic shipping. Geophys. Res. Lett., 45, 989898985.	Thank you for your comment. The text has been revised and this reference has been retained.	Yang Wang	Beijing Climate Center	China
51583	35	21	35	22	"Other emissions associated with shipping and aviation include black carbon and short-lived aerosols (e.g. sulphates)"; this statement applies to shipping, not aviation. Other emissions associated with aviation are mainly water vapor generating contrails and cirrus, NOx and soot.	Thank you, we have revised the text: The Paris Agreement primarily deals with national commitments relating to domestic emissions and removals, hence emissions from international aviation and shipping are not covered. According to 2018 data (not considering the effects of COVID-19), aviation is responsible for approximately 2.4% of total anthropogenic emissions of carbon dioxide, including land-use change, and shipping emits 2.9% of global anthropogenic carbon dioxide emissions (see Chapter 10 for a detailed discussion, with data on historical and current emissions from these sectors, including accountability and governance). In addition to carbon dioxide emissions, aircraft-produced contrail cirrus clouds and emissions of black carbon and short-lived aerosols (e.g. sulphates) from shipping are especially harmful for the Arctic (Qian et al. 2015; Ramanathan and Xu 2010; Stephenson et al. 2018; Pistone et al. 2019; Schaefer et al. 2014; Steffen et al. 2018; Lenton et al. 2019a; Kärcher 2018; European Commission 2020) (chapter 10).	eric lombard	Stay Grounded	France
12895	35	24	35	46	use Chapter with capital C for uniformity in whole text	Thank you, noted	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
2727	35	26			I am surprised that electric vehicles are only mentioned extremely briefly ("and facilitate electric transport", p. 36, 1.2) in this section even though transport is responsible for a considerable share of greenhouse gas emissions and much progress has been seen in the development and market uptake of electric vehicles since AR5.	Rejected. We agree that this is very short, but this is just a very short summary of trends and we have a separate chapter on transport (chapter 10).	Jan Wohland	ETH Zurich	Switzerland
2729	35	26			While I fully agree that information technology is very important and has massively improved over the last years, I wonder whether it is really the most important technology in the context of climate change (as suggested by mentioning it first in the chapter on technology). Given the absolutely central role of decarbonising electricity supply, I would think that the achieved cost reductions in wind and solar electricity generation as well as storage should be mentioned first. After all, a carbon free power supply is also a prerequisite for a zero-carbon IT sector. So I'd suggest to change the order of paragraphs 2 and 3 of this section.	Accepted - we moved this paragraph to the end of the section.	Jan Wohland	ETH Zurich	Switzerland
4379	35	26	35	26	pt. 1.5.3... Add Skills	Rejected- This section is about technology. Skills is a requirement for development of technology.	Alka Bharat	Maulana Azad National Instit	India
8973	35	26	37	38	No clear address to the question "Technology for what and for whom" is made in paragraph 1.5.3 (see for example Gonella, F., and Coauthors, 2019: Is technology optimism justified? A discussion towards a comprehensive narrative. Journal of Cleaner Production 223 (2019) 456e465. https://doi.org/10.1016/j.jclepro.2019.03.126).	Rejected. While we find this interesting, we have to be very short on the technology trends in this subsection	Francesco Gonella	Ca' Foscari University of Veni	Italy
22773	35	26	35	26	We suggest for this section to mention somewhere that technology can also lead to the emergence of new needs (filling up new niches) that can actually be resource intensive and add to carbon emissions. For example, all the emissions associated with the internet (emails, streaming videos, etc.) did not exist a few decades ago. So technology can not simply be seen as a source of solution, but potentially also a source of new problems.	Rejected - We agree, but this is already mentioned in the second paragraph where we mention rebound effects and higher needs for energy.	Government of France	Ministère de la Transition éc	France
31309	35	26			This whole section 1.5.3 seems superfluous as it just covers what is in the technology chapters without being a summary. Maybe just leave the first paragraph and explain which chapters cover the topics currently addressed but delete them. For example the reduction in solar PV costs is covered in 3 or 4 other chapters as well as here. the whole report seems to have a lot of repetition - possibly because of being unable to have face to face cross-chapter meetings at the recent LAMs.	Rejected - Chapter 1 is not supposed to just be a summary of the other chapters, but to give an introduction. Thus we cover parts of what will be covered in the other chapters as well. But we put this part in a broader perspective.	Ralph Sims	Massey University	New Zealand

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
5161	35	29	35	30	"The rapid developments in technology over the past decade enhance potential for transformative changes, in particular to help deliver climate goals simultaneously with other SDGs. Technological change has enabled both emissions reductions and increases in emissions. The challenge will be to enhance the synergies and minimise the trade-offs and rebounds." COMMENT: The following reference discusses exactly that: the conflict of reaching SDG 7.3 (energy efficiency) versus energy efficiency/rebound effects: REF: Heun MK, Brockway PE. Meeting 2030 primary energy and economic growth goals: Mission impossible? Appl Energy. 2019 Oct;251:112697.	Rejected - We do find our claim quite general, while this study focuses on energy efficiency in the UK and Ghana.	Paul Brockway	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
10513	35	29	35	30	again highlighting the opposition between synergies and trade-offs.	Rejected - We find this comment to be unclear.	Philippe Waldteufel	CNRS	France
45431	35	31	35	43	This chapter on ITC references (right so) the cross chapter box on digitalization in chapter 16. However, perhaps there is scope to add a short sentence here to mention to two key concerns that are explained in said box: the fact that ICT can compound and exacerbate current inequalities (particularly relevant here as this sector comes right in the middle of the SDGs discussion) and the issue of governance	Accepted	Elena Verdolini	University of Brescia and Eur	Italy
45433	35	31	35	42	The discussion around ITCs is placed before that of other more relevant climate-related technologies (such as the ones discussed in the following paragraphs). Given that energy and other climate-related technologies seem to be more relevant for decarbonization effort, while ICTs specifically may help or hinder, I would suggest moving this paragraph towards the end of this specific section on technologies.	Accepted	Elena Verdolini	University of Brescia and Eur	Italy
48163	35	31	35	43	The concept of "Energy-as-a-Service" (EAAS) needs to be added here, because EAAS is the latest concept about Energy developed with the development of information technology, and this concept (EAAS) will change the Energy development model to a large extent. EAAS is also mentioned in subsequent chapters. Supporting documents: IRENA (2020), Innovation landscape brief: Energy as a Service, International Renewable Energy Agency, Abu Dhabi.	Rejected - We see energy-as-a-service as a business model. We do not go into such details in this paragraph, and we think this may be covered by information technology and information.	Yang Wang	Beijing Climate Center	China
22775	35	35	35	38	We recommend to reformulate this paragraph in order to make it clearer	Accepted	Government of France	Ministère de la Transition éc	France
70277	35	41	35	43	Another important IT trend is the increase of data centres for storing and processing an increasing amount of data. Global data centres electricity consumption is estimated to be at 2% and growing, see Avgerinou, Maria; Bertoldi, Paolo; Castellazzi, Luca. 2017. "Trends in Data Centre Energy Consumption under the European Code of Conduct for Data Centre Energy Efficiency" Energies 10, no. 10: 1470. https://doi.org/10.3390/en10101470 Energies 10, no. 10: 1470.	Accepted	Philippe Tulkens	European Union (EU) - DG Re	Belgium
70279	35	41		43	... And the increase the requirement for energy, raising the demand for renewable energy and potentially the costs	Accepted.	Philippe Tulkens	European Union (EU) - DG Re	Belgium
72309	35	41	35	43	Another important IT trend is the increase of data centres for storing and processing an increasing amount of data. Global data centres electricity consumption is estimated to be at 2% and growing, see Avgerinou, Maria; Bertoldi, Paolo; Castellazzi, Luca. 2017. "Trends in Data Centre Energy Consumption under the European Code of Conduct for Data Centre Energy Efficiency" Energies 10, no. 10: 1470. https://doi.org/10.3390/en10101470 , which can be cited here.	Accepted	bertoldi paolo	european commission	Italy
5195	35	44	36	32	This whole paragraphs are dealing with electricity and do not deal with thermal energy. Building heating, desalination, industrial uses of heat are important enough to be mentioned here. Huge progresses have been made for example in heat network in large cities.	Accepted. We made a reference to chapter 6 on this.	Michel SIMON	Retraité/ Pdt d'association	France
61605	35	44	35	44	Instead of using "renewable" please use "wind and solar" to be more accurate.	Accepted. We changed this one place in this paragraph.	Rauli Partanen	Think Atom	Finland
77181	35	44	36	6	Since nothing is just black or white, it could be fair to include - like in the second period, for nuclear - a disclaiming sentence to raise attention on the challenge for the renewables perspective to materialize: the combined costs of generation and storage shall remain compatible with the ethical principle of affordability, and the technical needs of grid stability (challenged for higher penetrations of renewables) shall be overcome.	Rejected. While this is important, we need to keep this short. Chapter 6 discuss nuclear power in much more detail.	Giacomo Grasso	ENEA	Italy
12897	36	2	36	2	transport (chapter 10), Chapter	Thank you	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
22777	36	3	36	4	The reasons why generation III light water nuclear fission reactor could be ready needs to be precised. Is the level of technological development of generation III light water nuclear fission reactor comparable to solar and wind combined with storage technologies? We suggest to mention it	We changed this and made the sentence shorter without going into more discussion.	Government of France	Ministère de la Transition éc	France
48085	36	3	36	6	Stating that nuclear fission "could be ready for large scale deployment" if batteries fail seems to offer a false promise. Fission doesn't exist commercially, and, like any other non-existent technology, should not be promoted as a potential solution. Even if it does become available commercially in the mid 2030s, which there is no evidence for, that is far after a transition is needed given the need for an 80% transition by 2030. Only technologies that are available before 2030 can have a useful impact on eliminating warming and air pollution mortality (7 million deaths/year today) on the time scale needed.	Accepted. We rephrased this and made it shorter.	Mark Jacobson	Stanford University	United States of America
61607	36	3	36	6	"...but may fail if potential financial, safety, fuel cycle and regulatory risks are not properly managed (Abd Manan et al, 2015)." A similar broad and negative statement can be made for any energy source and is therefore unnecessary here. Further, all those issues mentioned are currently well-managed in the nuclear industry. Further, the cited reference discusses financial and regulatory risks in newcomer countries that which do not currently operate nuclear. While these are issues, most emissions come from countries that do have nuclear power in their mix and therefore do not face these risks. Also, even these countries receive much assistance in these issues from organizations like the IAEA, see IAEA Nuclear Security Series No. 29-G, https://www.iaea.org/publications/11169/developing-regulations-and-associated-administrative-measures-for-nuclear-security .	Accepted. We removed this sentence.	Rauli Partanen	Think Atom	Finland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
65643	36	3	36	6	"[...] but may fail if potential financial, safety, fuel cycle and regulatory risks are not properly managed (Abd Manan et al. 2015)." Remove or rephrase as imprecise and incorrect. The cited reference discusses only financial and regulatory risks that new builds may face in newcomer countries, that is, in countries which have not operated nuclear plants. The vast majority of the greenhouse gas emissions are generated in countries that already have nuclear facilities and the necessary regulations in place. Also, there are far more detailed accounts on recommendations for countries that are planning nuclear law (see, e.g., IAEA Nuclear Security Series No. 29-G, https://www.iaea.org/publications/11169/developing-regulations-and-associated-administrative-measures-for-nuclear-security). Finally, instead of using rather negative phrases such as "may fail", the authors ought to consider using more positive phrasing such as "regulations are needed to succeed".	See comment above.	Eero Hirvijoki	Aalto University	Finland
72871	36	3	36	6	This comment on generation III light water fission is ambiguous, because such reactors do exist already, but have a lot of difficulty coming to age as illustrated by AP1000 and EPR delays and difficulties in their construction due mainly to technical problems in management, in metallurgy and welding, so not the issues mentioned	Accepted. We made this sentence much shorter.	Antoine BONDUELLE	EE-Consultant	France
74159	36	3	36	6	the use of "but may fail" should be replaced with "could be challenged". There are over 50 Generation III reactors currently under construction. See - https://www.world-nuclear.org/information-library/current-and-future-generation/plans-for-new-reactors-worldwide.aspx#:~:text=Plans%20for%20New%20Reactors%20Worldwide,-(Updated%20January%202021&text=Nuclear%20power%20capacity%20worldwide%20is,being%20created%20by%20plant%20upgrading .	Accepted. We removed this.	Jeffrey Merrifield	Pillsbury Law Firm	United States of America
76587	36	3	36	4	Picturing nuclear power as "economical" is at odds with the current literature on the subject and the state of the art.	Accepted.	Charlotte MIJEON	Réseau "Sortir du nucléaire"	France
78489	36	3	36	6	Generation III light water nuclear fission reactors are ready for large scale deployment and are already implemented on large scale in several countries.	Accepted. We rephrased this sentence.	Tomaž Žagar	Faculty for Energy Technol	Slovenia
82601	36	3	36	6	Where the draft says "Also, Generation III light water nuclear fission reactors could be ready for large scale deployment contributing as an economical base load for energy (Knapp and Pevc 2018), but may fail if potential financial, safety, fuel cycle and regulatory risks are not properly managed (Abd Manan 6 et al. 2015)." In fact light water nuclear fission reactor unequivocally are available for large scale deployment. We would point to IEA Energy Technology Perspectives Clean Energy Technology Guide (https://www.iea.org/articles/etp-clean-energy-technology-guide) and IEA-NEA publication of the Projected Costs of Generating Electricity (https://www.iea.org/reports/projected-costs-of-generating-electricity-2020). The qualifying remarks regarding financial, fuel cycle and regulatory risks are not strictly necessary as all technologies are subject to different potential limitations	Accepted.	Jonathan Cobb	World Nuclear Association	United Kingdom (of Great Britain and Northern Ireland)
78231	36	4	36	6	Misrepresented fact - The statement on probable failure of large scale light water technology deployment presents the risk that are generic and associated with other types of energy sources as well. The statement may be removed.	Accepted.	Reetesh Chaurasia	Department of Atomic Energy	India
12899	36	5	36	5	managed (Abd Manan remove Abd and also correct it in refernces	We removed this reference.	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
20357	36	9	36	9	Please, ensure the image quality is sufficient to allow reading the figure and texts.	Addressed	Tommi Ekholm	Finnish Meteorological Instit	Finland
70281	36	9	36	11	What about offshore wind energy?	Included	Philippe Tulkens	European Union (EU) - DG Re	Belgium
22779	36	10	36	10	Figure 1.7 : The figure is blurry and the text too small, we suggest to update it with better quality	Addressed	Government of France	Ministère de la Transition é	France
45701	36	10	36	11	Please explain abbreviation 'solar PV' in caption.	Noted	Government of Germany	Federal Ministry for the Envir	Germany
78287	36	10	36	10	This is a different figure and construction from that used in later chapters. Lets ensure consistency.	We double-checked the data are consistent, but also we didn't see much value in IPCC wanting exactly the same Figure 4 times (SPM, TS, Chapter 1 and Chapter 2) and in the context of Chapter 1 wanted to bring out the most striking recent developments of all	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
12901	36	11	36	11	177/MW (p.12 note 4) remove (p.12 note 4)	Done	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
54563	36	11	36	11	Units are incorrect. Shoud be USD 50-177/MWh.	Done	Government of United States of America	U.S. Department of State	United States of America
9045	36	12	36	19	It is true that H2 is a zero-carbon energy vector but it is very important to explain that it belongs to the time of system used in order to produce H2. For example, it is possible to use solar panels, biomass and/or wind turbines in order to produce H2. Balat, H., Kirtay, E., 2010. Hydrogen from biomass e Present scenario and future prospects. Int J of hydrogen energy, Vol. 35, 7416-7426. / Pilavachi, P.A., Chatzipanagi, A.I., Spyropoulou, A.I., 2009. Evaluation of hydrogen production methods using the Analytic Hierarchy Process. International Journal of hydrogen energy, Vol.34, pp.5294-5303.	Accepted. We added a sentence saying that emissions depend on how it is produced.	Emmanuel Garbolino	Climpact Data Science	France
15465	36	12	36	19	Ammonia use for power plant or carrier of H2 should be added. (e.g. https://doi.org/10.1016/j.peccs.2018.07.001)	We agree, but due to space limits, we need to make this paragraph short.	Hiroaki Kondo	National Institute of Advance	Japan
28481	36	12	36	24	The text here refers to electricity and hydrogen as zero-carbon energy vectors. I see why, but I think this text fails to convey messages related with the crucial importance of production pathways needed to ensure that these energy vectors are low- (let alone zero-) carbon from a lifecycle perspective. I think the text should be revised to incorporate this sort of caveats. This is especially relevant for hydrogen, that ic currently massively produced from fossil fuels (as documented here: https://www.iea.org/reports/the-future-of-hydrogen) and is subject to significant thermodynamic losses across its supply and distribution chains. Similar concerns also apply to the way power-to-X fuels are presented.	Accepted. We added a sentence saying that emissions depend on how it is produced.	Pierpaolo Cazzola	International Transport Forum	France
31307	36	12			Not made clear here is the differences between green hydrogen (using renewable electricity for electrolysis so is zero C) brown hydrogen from coal gasification, grey hydrogen from natural gas, and blue hydrogen which is grey plus CCS. So it is NOT always zero-carbon as implied in this text.	We do not explain this here, but we added a sentence saying that emissions depend on how it is produced.	Ralph Sims	Massey University	New Zealand
69897	36	12	36	12	So far hydrogen is an industrial gas mostly used as a feedstock (entering the ammonia and methanol composition) or a process agent (clean oil products in refineries).	Noted. But it is also an energy vector.	Cédric PHILIBERT	Institut Français des Relation	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
69899	36	12	36	16	The most likely novel uses of green hydrogen (beyond replacing grey or black hydrogen in its current uses: refining and chemicals) in a decarbonising world is as a process agent in steel making (for direct iron reduction), not necessarily as an energy vector replacing fuels for high-temperature heat. It would be a zero-carbon energy vector if used as such or as ammonia (notably in deep sea shipping), and a lower-carbon energy vector if used to produce synthetic hydrocarbons (such as e-kerosene for aviation). Its uses for low-temperature uses in industry and buildings will likely be limited by a rather low efficiency by comparison with electricity-driven heat pumps.	Thanks for this information. We included the use of hydrogen as a process agent in steel production.	Cédric PHILIBERT	Institut Français des Relations Internationales	France
48087	36	13	36	15	An earlier citation than IEA (2019) for the proposed use of hydrogen for industrial processes and long-distance, heavy transport is Jacobson, M.Z., M.A. Delucchi, Z.A.F. Bauer, S.C. Goodman, W.E. Chapman, M.A. Cameron, Alphabetical: C. Bozonnat, L. Chobadi, H.A. Clonts, P. Enevoldsen, J.R. Erwin, S.N. Fobi, O.K. Goldstrom, E.M. Hennessy, J. Liu, J. Lo, C.B. Meyer, S.B. Morris, K.R. Moy, P.L. O'Neill, I. Petkov, S. Redfern, R. Schucker, M.A. Sontag, J. Wang, E. Weiner, A.S. Yachanin, 100% clean and renewable wind, water, and sunlight (WWS) all-sector energy roadmaps for 139 countries of the world, Joule, 1, 108-121, doi:10.1016/j.joule.2017.07.005, 2017	Thank you for making us aware of this reference, but we think the IEA reference fits better here.	Mark Jacobson	Stanford University	United States of America
69901	36	16	36	19	One should distinguish here the production and transport infrastructures, which can be based on current uses of grey and black hydrogen, and the most likely new uses of green hydrogen in industry and long-range aviation and shipping, and the delivery hydrogen infrastructure for much more speculative uses (in ground transportation and heat) which also require a much more expensive distribution infrastructure, from gas networks to refilling stations. The latter are indeed quite uncertain, but the former are significantly more certain - and more economic due to scale effects.	Thank you for pointing this out, but due to space limits, we just added a sentence saying that emissions depend on how it is produced.	Cédric PHILIBERT	Institut Français des Relations Internationales	France
69903	36	17	36	19	The valid reasons to use H2 from natural gas, either through steam methane reforming with CCS ("blue" H2) or through methane splitting ("turquoise" H2, with no CO2 production associated), do not derive from infrastructure uncertainties, but rather from the need to first direct growing amounts of renewable electricity to substitute fossil-based electricity (in its current and new uses), before producing hydrogen for other uses, as the CO2 emission reductions will be larger in the former than in the latter use.	Thanks for the comment. We added a sentence saying emissions depend on how it is produced.	Cédric PHILIBERT	Institut Français des Relations Internationales	France
77183	36	17	36	19	A number of studies exist as well for the production of H2 from nuclear, which would not even require CCS, thus costing much less and with much better environmental footprint. See, for example "Hydrogen Production using Nuclear Power" (IAEA Nuclear Energy Series NP-T-4.2) "Hydrogen as an Energy Carrier and Its Production by Nuclear Power" (IAEA TECDOC No. 1085)	Thanks for the comment. Due to space limits, we added a sentence saying that emissions depends on how it is used.	Giacomo Grasso	ENEA	Italy
22859	36	20	36	27	We suggest to consider that there are however important concerns about the sustainability of such fuels - a lot depends on how they are produced and used and their overall carbon footprint, for this paragraph	Agree. We have already mentioned that it depend on how it is produced.	Government of France	Ministère de la Transition écologique	France
60445	36	20	36	24	Rephrase as follows: In addition to hydrogen, CCU strategies such as CO2 based fuels.....	Thank you, we have added this clarification	Célia Sapart	Université Libre de Bruxelles	Belgium
69905	36	20	36	21	I would first mention ammonia here, a carbonless e-fuel that, if not an exact "drop-in" fuel, will likely be used in power plants and in the internal combustion engines of deep sea ships as a more convenient hydrogen carrier than hydrogen itself, be it compressed or liquefied.	Rejected. We deleted the term e-fuel in the text and base this paragraph on CO2 based fuels.	Cédric PHILIBERT	Institut Français des Relations Internationales	France
72437	36	20	36	20	"e-fuels or Power-to-X" these two terms should be defined, either here or in Annex-A or -B	We moved these concepts from the text.	Sylvain Pichat	University of Lyon, Ecole normale supérieure de Lyon	Germany
76305	36	20	36	24	Suggestion to rephrase: In addition to hydrogen, CCU strategies such as CO2 based fuels.....	Thank you, we have added this clarification	Deepak PANT	Flemish Institute for Technological Research	Belgium
78743	36	20	36	26	this correct statement is further grounded in highly detailed energy-industry transition study by Bogdanov et al. (https://www.sciencedirect.com/science/article/pii/S0306261920316639), and a recent report commissioned by the German Energy Agency (https://www.powerfuels.org/fileadmin/powerfuels.org/Dokumente/Global_Alliance_Powerfuels_Study_Powerfuels_in_a_Renewable_Energy_World.pdf). Both documents are based on hourly resolution analyses and cost-optimised investigations, while no comparable studies on that level of detail are known by the reviewer.	Noted.	Christian Breyer	LUT University	Finland
78801	36	20	36	24	The description of CCU (Carbon Capture and Utilization) could be provided in this section since CO2-based fuels are part of these technologies dedicated to reduce GHG emission by substituting fossil resources by CO2 and low carbon energies. CCU is also employed in various sectors such as chemistry. Suggestion : "In addition to hydrogen, CCU strategies like CO2-based fuels (or e-fuels or Power-to-X) provide important low-carbon alternatives to fossil fuels if produced using low-carbon energy sources (Ch 10)"	Accepted.	Sylvain Nizou	CEA	France
83689	36	20	36	24	Rephrase as follows: In addition to hydrogen, CCU strategies such as CO2 based fuels.....	Thank you, we have added this clarification	Christian Breyer	LUT University	Finland
12903	36	21	36	21	sources (Ch 10). Write as Chapter 10	Thank you	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
69907	36	21	36	24	I would say CO2-based fuels and feedstocks. Methanol, notably, has many uses as feedstock, which represent 60% of its demand, vs. 40% as energy uses (as such or as feed for DMTE, gasoline, etc.)	Accepted.	Cédric PHILIBERT	Institut Français des Relations Internationales	France
48089	36	22	36	23	The production of synthetic combustion fuels to replace hydrocarbons combustion merely allows air pollution to persist so is not a recognized solution to the problems we face, which include air pollution mortality (7 million deaths/year), energy insecurity, and global warming. Please remove this proposal.	Thanks for the comment. This was not meant as a proposal. We removed the word "important" to stress this. This sub chapter on technology just provides as overview of technologies as drivers of mitigation, and emissions will go down if these fuels are made from captured CO2 instead of fossil fuels. We would need a reference if we should write that local air pollution would not be reduced.	Mark Jacobson	Stanford University	United States of America
69909	36	27	36	29	I would write the second part of the sentence as "introducing radically new and more environmentally-friendly materials and production processes". The carbon emissions associated with the production of some of these materials is a small evil compared to some other environmental issues associated with extraction and processing.	Accepted.	Cédric PHILIBERT	Institut Français des Relations Internationales	France
45741	36	29	36	32	Please correct number of full-scale CCS sites from nineteen to "five". COMMENT: To account for experience to full cycle Carbon Capture and Storage (CCS) only projects with dedicated storage are suitable. The number of full-scale CCS-sites thus is five (IEA, 2020). The higher number given in the draft text incorporates Enhanced Oil Recovery projects (EOR) – most of which don't even use monitoring – these projects do not yield any experience in terms of storage safety or permanence of storage. --- IEA, 2020, Energy Technology Perspectives 2020 - Special Report on Carbon Capture, Utilisation and Storage, September 2020.	We have deleted this sentence.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
15717	36	33	37	16	The paragraph on terrestrial systems tends to jump back and forth between different topics, and does not provide a clear description of how to manage the trade-offs between different land uses (for bioenergy, food and fibre, and sequestration). I think one should first explain these trade-offs, then potential solution to reduce the conflicts between the different land uses.	Rewritten	Katarina Elofsson	Aarhus University	Denmark
70283	36	33	37	16	How about aquatic sphere? Blue economy? Marine ecosystems?	Hard to pack everything in to our Intro chapter	Philippe Tulkens	European Union (EU) - DG Re	Belgium
12785	36	34	37	1	Statements like these on offsetting through afforestation projects need to include acknowledgement of the large number of studies pointing out that these projects suffer from problems with ensuring additionality and permanence as well as that they systematically have failed to deliver the proposed co-benefits to local people. Many studies show how exploitation of marginalised people's lands and livelihoods with resulting impoverishment have resulted from carbon forestry projects. References: Hajdu F, Fischer K, Penje O 2016 Questioning the use of 'degradation' in climate mitigation: A case study of a forest carbon CDM project in Uganda. Land Use Policy. 59 (31) 412–422. Available Open Access. DOI: 10.1016/j.landusepol.2016.09.016 Lyons, K. & Westoby, P. (2014). Carbon colonialism and the new land grab: Plantation forestry in Uganda and its livelihood impacts. Journal of Rural Studies, 36(2014), 13-21. doi: 10.1016/j.jrurstud.2014.06.002 Blum, M., 2020. Whose climate? Whose forest? Power struggles in a contested carbon forestry project in Uganda. Forest Policy and Economics, 115, p. 1-10. DOI: 10.1016/j.forpol.2020.102137.: Bumpus, A. G. & Liverman, D. M. (2008). Accumulation by Decarbonization and the Governance of Carbon Offsets. Economic Geography, 84(2), 127-155. doi: 10.1111/j.1944-8287.2008.tb00401.x.; Edstedt, K. & Carton, W. (2018). The benefits that (only) capital can see? Resource access and degradation in industrial carbon forestry, lessons from the CDM in Uganda. Geoforum, 97(2018), 315-323. doi: 10.1016/j.geoforum.2018.09.030.; Fisher, J. (2013). Justice implications of conditionality in Payments for Ecosystem Services: a case study from Uganda. In: T. Sikor (Ed.), The Justices and Injustices of Ecosystem Services (p.21-45). New York: Routledge. ; + many more and those referenced in these publications	This is well covered in Chapter 7 in particular (also somewhat Chapter 14), but this is too much detail for our Intro chapter	Flora Hajdu	Swedish University of Agricul	Sweden
9837	36				Fig. 1.7. The figure is in a very low pixel quality. It should be changed with a higher resolution figure too.	Noted	Government of Indonesia	Ministry of Environment and	Indonesia
72873	36		36		The figure gives a cost per MWh but the legend say /MW. In addition, the cost indicated for both solar and wind could be a bracket with a lower range, according to IRENA (2020)	Noted	Antoine BONDUELLE	EE-Consultant	France
83011	37	5	37	6	This is not a feature of net zero scenarios but of those going net negative (or, maybe better: low-stabilization scenarios, or 1.5-2C scenarios)	Noted, sentence replaced	Geden Oliver	German Institute for Internat	Germany
11995	37	7	37	9	Additional to the quoted refs HU, B. Z., YILIN, LI, YI: TENG, YANGUO: YUE, WEIFENG 2020. Can bioenergy carbon capture and storage aggravate global water crisis? Science of The Total Environment, 714, 136856.) finds water needs for BECCS in the delivery of RCP2.6 will increase global water stress by 2100 (by between 13% and 26% dependant on crop) and that, secondary environmental impacts from additional fertiliser and pesticide use may off-set the CDR potential, and will increase water pollution risks.	We think this better addressed in the Chapter box on land use and BECCS - beyond Chapter 1	Paul Rouse	Carnegie Climate Governance	United Kingdom (of Great Britain and Northern Ireland)
29015	37	9	37	12	The paper cited by Realmonde also concluded that DACCS should be deployed alongside rather than instead of other mitigation options.	Noted. This does not contradict the statement which simply says that DACCS reduces reliance on BECCS to deliver negative emissions.	Jasmin Kemper	IEAGHG	United Kingdom (of Great Britain and Northern Ireland)
11997	37	10	37	11	Whilst CO2 direct air capture with CCS (DACCS) may reduce reliance on bioenergy to deliver negative emissions it should be noted that DACCS has downsides to balance the statement. For example, it would require very significant energy input for example see a meta review of DACCS energy requirements by Daggash et al. DAGGASH, H., FAJARDY, M., HEPTONSTALL, P., MAC DOWELL, N. & GROSS, R. 2019. Bioenergy with carbon capture and storage, and direct air carbon capture and storage: Examining the evidence on deployment potential and costs in the UK In: TECHNOLOGY, C. F. E. P. A. (ed.) UK Energy Research Centre Technology and Policy Assessment Imperial College Centre for Energy Policy and Technology	We think this better addressed in the X-Chapter box on CDR and in Chapter 12 - beyond Chapter 1.	Paul Rouse	Carnegie Climate Governance	United Kingdom (of Great Britain and Northern Ireland)
28483	37	11	37	12	The text on direct air capture with CCS (DACCS) fails entirely to flag that this technology, while it does reduce reliance on bioenergy to deliver negative emissions, also comes with significant additional energy requirements and that, similar to hydrogen, ensuring that its application leads to net GHG emission savings requires a laser focus on low-carbon energy sources for the supply of that energy. Waster heat recovery could also have a role, but not if the waste heat is the result of the installation of new facilities (e.g. Fischer Tropsh plants for the production of synfuels) that are reliant on fossil energy. The use of fossil energy for DACCS is also subject to emissions of local air pollutants. And additional energy requirements are increase social costs relative to a no capture context, even when renewable electricity is the primary source of energy for DACCS. See https://web.stanford.edu/group/efmh/jacobson/Articles/Other/19-CCS-DAC.pdf . I think that the text of this section should be amended to acknowledge these important criticalities.	We think this better addressed in the X-Chapter box on CDR and in Chapter 12 - beyond Chapter 1.	Pierpaolo Cazzola	International Transport Forum	France
8867	37	12	37	12	Kato and Kurosawa (2021, Sustainability Science, doi:10.1007/s11625-021-00908-z) assesses the role of DACCS and BECCS in a national context.	We think this better addressed in the X-Chapter box on CDR and in Chapter 12 - beyond Chapter 1.	Etsushi Kato	Institute of Applied Energy	Japan
8053	37	14	37	15	Please do not use euphemisms from advertising: what you refer here to is not "meat innovation", it is a replacement.	Thank you for pointing this out. I have corrected this to "substitutes"	Joachim Rock	Thuenen-Institute of Forest E	Germany
86751	37	14	37	15	Same as previous comment on the recommendation to reduce meat consumption in order to keep production between "planetary boundaries". We suggest deleting the phrase.	Noted	Government of Argentina	Ministry of Environment and	Argentina

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
2731	37	17	37	23	Classifying direct air capture as geoengineering appears far-fetched and questionable in my view because DAC does nothing else than changing the CO2 concentrations in the atmosphere. So, if you count DAC as geoengineering, BECCS would also have to be geoengineering. In fact, all other processes that either emit or absorb CO2 should consequently also be considered geoengineering (like driving a car or planting roses). Ultimately, such a very broad definition of geoengineering becomes useless. Putting DAC in the same category as SRM also appears very questionable because the risks associated with SRM are substantially larger than those with DAC. I think that a more nuanced classification is needed here that separates between relatively low risk negative emission technologies that basically all 1.5°C scenarios rely on (i.e., BECCS or DAC) and higher risk options (like SRM).	DAC has been referred to as a potential geoengineering approach in a great deal of literature and these sentences reflect its prominence in that literature. Geoengineering activities must be involve a primary intent to counteract effects of climate change, so don't include all activities that emit or absorb CO2. It's important to provide examples of activities that the word geoengineering has been used to refer to – the remainder of the paragraph makes it clear that CDR and SRM (and the specific technological proposals) have very different properties.	Jan Wohland	ETH Zurich	Switzerland
4195	37	17	37	29	In view of recent developments in nuclear technology (e.g. relatively quick-to-build SMRs) and the highly increased interest in nuclear energy among policy makers and public in some countries, it is weird that WGIII part spends so much space on politically less feasible technologies like SRM and virtually none on nuclear options. It is probably too late to add this to the report, but it will be noted and will be used to argue (plausibly, I would say) that IPCC is not neutral but politically biased.	Nuclear technology is addressed elsewhere in the report. The small amount of space spent on SRM in the chapter (3 sentences) reflects its modest presence in current climate science and policy conversations.	Marcel Wissenburg	Radboud University Nijmegen	Netherlands
6903	37	17	37	17	Why is Chapter 1 using the term geoengineering? SR1.5 explicitly avoided using this term. Please refer to section 4.3.8 of SR1.5 and the glossary.	Rejected. Geoengineering is frequently used term by the press, by many of the environmental interest groups that have engaged with the idea, and it's still the most frequently used term in the academic literature, and by many of the scientists actually working on the topic (see, e.g., the recent US National Academies report on solar geoengineering research and research governance). To avoid the word in this important climate change science document, would make it more difficult for people to find the relevant information and familiarize themselves with the topic. Nonetheless, it is only used twice in order to explain what the term means and summarize what some of the generic concerns about the proposals are (for example, survey-based studies show that moral hazard is a concern for both SRM and CDR as neither address the root cause of climate change).	Debra Roberts	Ethekwini Municipality	South Africa
22781	37	17	37	17	We suggest to replace the term "geoengineering". Indeed, it is said elsewhere (cf 14.4.5) that AR6 avoids the use of the term "geoengineering" - this paragraph should be redrafted in line with that practice	Rejected. Geoengineering is frequently used term by the press, by many of the environmental interest groups that have engaged with the idea, and it's still the most frequently used term in the academic literature, and by many of the scientists actually working on the topic (see, e.g., the recent US National Academies report on solar geoengineering research and research governance). To avoid the word in this important climate change science document, would make it more difficult for people to find the relevant information and familiarize themselves with the topic. Nonetheless, it is only used twice in order to explain what the term means and summarize what some of the generic concerns about the proposals are (for example, survey-based studies show that moral hazard is a concern for both SRM and CDR as neither address the root cause of climate change).	Government of France	Ministère de la Transition é	France
25101	37	17	37	17	Not sure we can say these are 'speculative'	By speculative, we mean that they are proposed but have not been extensively not developed, tested or deployed.	Minal Pathak	WGIII TSU, Ahmedabad Univ	India
28485	37	17	37	29	This whole section seems very light on the large uncertainties and risks associated with CDR technologies. I thin it should be revised to give more prominence to these. These considerations are especially important for ocean iron fertilisation, which gets mentioned but is not listed as a subject far from being consensual (actually, quite the opposite) to deliver improvements on climate change mitigation, and one that comes with significant associated risks. See https://tos.org/oceanography/article/ocean-fertilization-science-policy-and-commerce . See also https://www.cbd.int/doc/publications/cbd-ts-45-en.pdf .	Agree, have edited to mention potential environmental impacts of CDR	Pierpaolo Cazzola	International Transport Forum	France
29721	37	17	37	29	We find it surprising that you use the term Geoengineering here, especially since you also directly link this to CDR technologies. As a general comment we would encourage you to clearly separate between SRM and CDR, and refrain from using the term Geoengineering. When it comes to information provided in this para we believe that elements of it is currently inappropriate, and if kept it would be important to also include uncertainties, immaturity, unconditional side-effects etc. Currently it is unbalanced in our view. With regards to SRM, the inclusion in Chapter 1 seems out of scope. The only reference to SRM in the outline to this report is to Chapter 14, and then only about "Ethics and governance". It would in our view be most appropriate to delete this information.	Rejected. Geoengineering is frequently used term by the press, by many of the environmental interest groups that have engaged with the idea, and it's still the most frequently used term in the academic literature, and by many of the scientists actually working on the topic (see, e.g., the recent US National Academies report on solar geoengineering research and research governance). To avoid the word in this important climate change science document, would make it more difficult for people to find the relevant information and familiarize themselves with the topic. Nonetheless, it is only used twice in order to explain what the term means and summarize what some of the generic concerns about the proposals are (for example, survey-based studies show that moral hazard is a concern for both SRM and CDR as neither address the root cause of climate change).	Government of Norway	Norwegian Environment Agency	Norway
43067	37	17		28	This means that SRM will probably be needed to shave peak temperatures and prevent overshoot: "Carbon dioxide removal (CDR) technologies are currently more expensive per ton CO2 than renewables and other forms of mitigation. SRM, which would cool the planet by reflecting incoming sunlight, is appealing for its low estimated direct costs and rapid timescales for cooling. Geoengineering proposals are in early stages of technological development and have not been tested or deployed beyond the pilot stage. Understanding of the climate response to SRM remains subject to large uncertainties (AR6 WG1)."	Noted, but implication for text unclear.	Graeme Taylor	BEST Futures	Australia
60217	37	17	37	19	This section on geoengineering is not consistent with later considerations on why the umbrella term is avoided in AR6 (chapter 14.4.5, p. 2322, in 22-26).	Rejected. Geoengineering is frequently used term by the press, by many of the environmental interest groups that have engaged with the idea, and it's still the most frequently used term in the academic literature, and by many of the scientists actually working on the topic (see, e.g., the recent US National Academies report on solar geoengineering research and research governance). To avoid the word in this important climate change science document, would make it more difficult for people to find the relevant information and familiarize themselves with the topic. Nonetheless, it is only used twice in order to explain what the term means and summarize what some of the generic concerns about the proposals are (for example, survey-based studies show that moral hazard is a concern for both SRM and CDR as neither address the root cause of climate change).	Felix Schenuit	University Hamburg	Germany

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63203	37	17	37	20	Defining/describing geoengineering can be problematic given that some approaches - afforestation and land/soil management approaches - are already familiar and don't seem to fit easily under a label such as geoengineering. Here, geoengineering is described as referring primarily to speculative technological approaches for achieving CDR or SRM. However, the National Research Council work (2015), cited here, included BECCS and changes in land use management among its study of CDR options in addition to more speculative, technological approaches. Recommend the authors add some text to clarify how the categorization of CDR approaches as geoengineering approaches may be changing, and to flag that the scale of interventions has traditionally been a criterion for whether land-based CDR is considered geoengineering or not.	Revised definition sentence address scale and intent.	Government of Canada	Environment and Climate Ch	Canada
70285	37	17	37	29	This paragraph on geoengineering should be more neutral and nuanced. Firstly remove the description of certain technologies as "appealing". Simply state that CDR presents an opportunity to draw down CO2, and that SRM could (in theory) present an opportunity to cool the planet. It should also mention that geo-engineering is governed (near-prohibited) by certain international conventions (the CBD and London Protocol), and that the Paris goal (Art 4.1) implicitly rules out SRM since it is described in terms of GHG. Finally, the CDR part should mention that this technology is of interest not due to its cost or ease of scaleability, but because pathways in this report and SR1.5 have identified that net zero emissions followed by net negative emissions are needed for below 2°C. This implies that CDR is necessary, but also that it must be additional to deep decarbonisation, with only a limited amount residual emissions to be offset by CDR.	Accepted removal of "appealing".	Philippe Tulkens	European Union (EU) - DG Re	Belgium
75779	37	17	37	29	Perhaps SRM should be separated from CDR in the discussion as it might be the false impression that both of them have similar risks, challenges, technological development. This is the main critique from [7] which could be used to improve the framing of the paragraph [7] https://www.nature.com/articles/s41561-019-0475-7	Agree that whether a given CDR proposal qualifies "geoengineering" depends on the context. They are grouped in a paragraph in reference to instances in which CDR is geoengineering (e.g., large-scale implementation of ocean alkalization)	Herib Blanco	International Renewable Ene	Germany
80185	37	17	37	29	CDR and SRM are not treated neutrally in this paragraph. As per AR6 WG3 Ch.1 pg.9 lines 13-14, "both measures involve uncertain costs environmental risks and governance challenges." but environmental risks and governance challenges are only mentioned in reference to SRM. In particular, the effect of ocean-based approaches on ecosystems is highly uncertain and likely highly significant at scale, as the mechanism of action implies a dramatic acceleration of oceanic biological productivity at a global scale and/or chemical processes that would otherwise proceed at geological rates. These techniques are much less studied than SAI, and present the same thorny governance challenges due to global shared oceanic resources and transboundary effects. See discussion of these elements as per CDR in AR6 WG3 Ch 12.7.1 and Ch 17	Agree on CDR impacts, have edited to mention potential environmental impacts of CDR, however disagree that SRM and CDR have equivalent risks according to literature to date and should be treated equally.	Kelly Wanser	SilverLining	United States of America
80187	37	17	37	23	This section omits even the mention of the uncertain side-effects and governance or ethical challenges from CDR. These elements are mentioned in the Technical Summary (see AR6 WG3 TS Pg.89 Lines 22-25) and the Summary for Policymakers (AR6 WG3 SPM pg. 25 lines 35-38), their absence here threatens neutrality and is policy-prescriptive.	Agree, have edited to mention potential environmental impacts of CDR	Kelly Wanser	SilverLining	United States of America
80189	37	17	37	29	The term "geoengineering" should be eliminated from this paragraph. It does not appear in the rest of the report except to mention that its use has been deprecated in favor of the more specific terms CDR and SRM.	Rejected. Geoengineering is frequently used term by the press, by many of the environmental interest groups that have engaged with the idea, and it's still the most frequently used term in the academic literature, and by many of the scientists actually working on the topic (see, e.g., the recent US National Academies report on solar geoengineering research and research governance). To avoid the word in this important climate change science document, would make it more difficult for people to find the relevant information and familiarize themselves with the topic. Nonetheless, it is only used twice in order to explain what the term means and summarize what some of the generic concerns about the proposals are (for example, survey-based studies show that moral hazard is a concern for both SRM and CDR as neither address the root cause of climate change).	Kelly Wanser	SilverLining	United States of America
81133	37	17	37	29	Please note that chapter 14 states (correctly) that since and including the SR15, the IPCC has avoided the term "geo-engineering" as it lumps in an unhelpful way a wide range of activities especially in CDR, where it really makes little sense to call them all "geo-engineering". I would recommend that the authors of chapter 1 consult with chapter 12 and 14, and avoid the term geo-engineering - or at best, make clear that the term is used in some (often grey) literature and by some stakeholders, but is unhelpful for a systematic characterisation and assessment by the IPCC especially of CDR. In general, please ensure you cross-reference and consult with chapters 7, 12 and 14, all of which treat relevant CDR dimensions (e.g. biomass production for BECCS in chapter 7, other CDR options and governance dimensions in chapter 12, and international governance for CDR and SRM in chapter 14).	Rejected. Geoengineering is frequently used term by the press, by many of the environmental interest groups that have engaged with the idea, and it's still the most frequently used term in the academic literature, and by many of the scientists actually working on the topic (see, e.g., the recent US National Academies report on solar geoengineering research and research governance). To avoid the word in this important climate change science document, would make it more difficult for people to find the relevant information and familiarize themselves with the topic. Nonetheless, it is only used twice in order to explain what the term means and summarize what some of the generic concerns about the proposals are (for example, survey-based studies show that moral hazard is a concern for both SRM and CDR as neither address the root cause of climate change).	Andy Reisinger	Ministry for the Environment	New Zealand
83013	37	17	37	29	"Geoengineering" fell out of use with SR1.5, with a preference not to use it as an umbrella term in IPCC reports anymore (see also COGS). It's unclear why CDR technologies are referred to here as "speculative" and afforestation and BECCS aren't mentioned here. In case you want to differentiate among CDR options, please use the categorization in ch12 (figure 12.3). For SRM, please use the Glossary definition and refer to chapter 14 for treatment of governance but also to the cross-WG box on SRM located there	Geoengineering is frequently used term by the press, by many of the environmental interest groups that have engaged with the idea, and it's still the most frequently used term in the academic literature, and by many of the scientists actually working on the topic (see, e.g., the recent US National Academies report on solar geoengineering research and research governance). To avoid the word in this important climate change science document, would make it more difficult for people to find the relevant information and familiarize themselves with the topic. References to Ch 12 and 14 have been inserted as suggested	Geden Oliver	German Institute for Internat	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
45703	37	18	37	28	Section 14.4.5. states "Therefore, as in SR1.5, ambiguous umbrella terms like 'geoengineering' or 'climate engineering' are avoided in AR6." Therefore, please delete the term "geoengineering" in chapter 1, or at least refer to the careful discussion of this term at the beginning of section 14.4.5. In addition, please delete the judgemental word "appealing" and write instead: "... (CDR) technologies, ...", aim to draw down atmospheric CO2 at rates that far exceed those associated with the Earth's natural carbon cycle, but are currently more expensive per ton CO2 than renewables and other forms of mitigation. SRM technologies aim to cool the planet by reflecting incoming sunlight and are associated with low estimated direct costs and rapid timescales for cooling ..." Furthermore, please revise the statement "Geoengineering proposals are in early stages of technological development and have not been tested or deployed beyond the pilot stage" since it is not in agreement with other chapters in this report, including 6,7, and 12.	Accepted removal of "appealing". References to chapters 14 and 12 inserted. Geoengineering remains in order to provide a point of reference for this still commonly used term.	Government of Germany	Federal Ministry for the Environment	Germany
11999	37	19	37	19	The referenced list of potential CDR techniques is very limited, and the reference given is somewhat outdated in the light of developments. More recent, more comprehensive reviews include FLORIN, M.-V. (ED.), ROUSE, P., HUBERT, A.-H., HONEGGER, M., REYNOLDS, J. 2020. International governance issues on climate engineering. Information for policymakers. Lausanne: EPFL International Risk Governance Centre (IRGC), FUSS, S., LAMB, W. F., CALLAGHAN, M. W., HILAIRE, J., CREUTZIG, F., AMANN, T., BERINGER, T., DE OLIVEIRA GARCIA, W., HARTMANN, J., KHANNA, T., LUDERER, G., NEMET, G. F., ROGELI, J., SMITH, P., VICENTE, J. L. V., WILCOX, J., DEL MAR ZAMORA DOMINGUEZ, M. & MINX, J. C. 2018. Negative emissions—Part 2: Costs, potentials and side effects. Environmental Research Letters, 13, 063002. The inclusion of the following would be more comprehensive: Carbon sequestration in soils, crop residue oceanic carbon sequestration, direct air capture with carbon storage (DACCS), enhancing oceanic alkalinity, enhanced terrestrial weathering, macroalgal cultivation for sequestration, ocean fertilisation with iron, oceanic micro-nutrients, nitrogen and phosphorus fertilisation, ocean carbon capture and storage (OCCS), restoring wetlands, afforestation and reforestation, artificial upwelling or downwelling, biochar, bioenergy with carbon capture and storage (BECCS) and building with biomass	References added. The introduction to CDR is short due to space constraints	Paul Rouse	Carnegie Climate Governance	United Kingdom (of Great Britain and Northern Ireland)
22783	37	20	37	20	Defining "enhanced weathering and "ocean alkalisation" would be important for a better comprehension of the reader.	Rejected due to space constraints	Government of France	Ministère de la Transition écologique	France
22785	37	20	37	20	Concerning the term "appealing" we recommend to replace it with "might provide the opportunity"	Accepted, text revised	Government of France	Ministère de la Transition écologique	France
45743	37	20	37	22	Please add literature sources for this statement.	Accepted. Fuss, S., Lamb, W. F., Callaghan, M. W., Hilaire, J., Creutzig, F., Amann, T., ... & Minx, J. C. (2018). Negative emissions—Part 2: Costs, potentials and side effects. Environmental Research Letters, 13(6), 063002.	Government of Germany	Federal Ministry for the Environment	Germany
48091	37	21	37	22	Direct air capture increases air pollution and mining and hardly reduces carbon so should not be promoted as a solution. Jacobson, M.Z., The health and climate impacts of carbon capture and direct air capture, Energy and Environmental Sciences, 12, 3567-3574, doi:10.1039/C9EE02709B, 2019.	This paragraph does not promote DAC or any of the described approaches, have edited to mention potential environmental impacts of CDR	Mark Jacobson	Stanford University	United States of America
45745	37	22	37	23	Please add: However, "[q]uantifying how the carbon cycle responds to negative emissions is an important knowledge gap for strong mitigation pathways" (IPCC SR 1.5, 2018; AR6 WG I as appropriate).	Agree, but rejected due to space considerations. There are many details about the properties of CDR and SRM that we are not able to delve into in this chapter, due to geoengineering's modest space allotment	Government of Germany	Federal Ministry for the Environment	Germany
45747	37	22	37	23	Economic costs are only one impeding factor for CDR technologies. Please add further aspects (or delete the sentence "but are currently ..."). Please modify the sentence by adding as follows: "But CDR technologies require resources, like land, energy or water and may have impacts on the environment. These effects can have a net warming or a cooling effect. (e.g. Royal Society/Royal Academy of Engineering, Greenhouse Gas Removal, 2018, p. 10, p 70 et seq.) Thus sustainability issues may place constraints on their applicability. Moreover, they are currently more expensive than..."	Agree, have edited to mention potential environmental impacts of CDR	Government of Germany	Federal Ministry for the Environment	Germany
70287	37	22	37	23	Geoengineering - but are currently more expensive per ton CO2 than renewables and other forms of mitigation' to add, at least for the ocean part that these technologies are highly controversial, uncertain, with very important negative side effects, short lived mitigation, the cost and emission of the technology needs to be factored in as well, etc. GESAMP, London Protocol. Maybe there is a need to distinguish/eperate land from sea/ocean.	Agree, have edited to mention potential environmental impacts of CDR. Space considerations constrain our ability to go into depth on some of these issues	Philippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
11107	37	23	37	23	Need to write out SRM the first time used. Cross reference Chapter 14 and the cross-WG box it contains.	Accepted	Anthony Patt	ETH Zürich	Switzerland
50569	37	23	37	25	SRM does not mitigate ocean acidification. Is the cost of ocean acidification counted when estimating the cost of SRM?	No, this is why we write "low direct costs" rather than "low costs"	Anne Marie Treguier	CNRS	France
86429	37	23	37	23	The acronym "SRM" (= Solar Radiation Modification), while given earlier, is not defined in this paragraph	Accepted.	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
8877	37	24	37	24	May be worth mentioning the growing activity of asset managers in pushing for net-zero commitments.	Noted, but implication for text unclear.	Seth Dunn	ServiceMax	United States of America
45749	37	24	37	24	Please delete: "is appealing for its low estimated direct costs" and insert instead in line 25: "direct cost is unlikely to be a limiting factor" COMMENT: The direct costs are not the decisive criteria, it is not to be enumerated first as being - without doubt - "appealing", which is also an inappropriate value judgement	Accepted, text revised	Government of Germany	Federal Ministry for the Environment	Germany
12001	37	25	37	27	More comprehensive reviews of SRM than the given reference would be helpful here. I suggest, for example, REYNOLDS, J. L. 2019. The Governance of Solar Geoengineering: Managing Climate Change in the Anthropocene, Cambridge, Cambridge University Press. And FLORIN, M. et al. 2020. International governance issues on climate engineering - Information for policymakers. International Risk Governance Centre (IRGC). Lausanne, Switzerland: EPFL Scientific Publications https://innocence/record/277726 .	References revised	Paul Rouse	Carnegie Climate Governance	United Kingdom (of Great Britain and Northern Ireland)
22789	37	25	37	26	We suggest to briefly specify the principle of these techniques (for instance, Marine Cloud Brightening: refers to manipulating cloud cover to reflect more sunlight back to space).	Rejected due to space constraints	Government of France	Ministère de la Transition écologique	France
48093	37	25	37	29	Geoengineering through solar radiation management and cloud brightening merely masks the problem of global warming and has side effects, so is not a solution to anything. Please do not promote useless solutions.	Rejected. We are careful and cautious in our (very brief) discussion of SRM	Mark Jacobson	Stanford University	United States of America
45751	37	26	37	26	Please specify: "Probable and uncertain side effects"; COMMENT: Some Side effects are almost certain.	Unclear what side effects of SRM are almost certain. This is not consistent with the latest assessments of SRM which indicate high uncertainty in all areas of impacts except for global mean temperature.	Government of Germany	Federal Ministry for the Environment	Germany
86431	37	27	37	27	Text should more openly refer to high level of danger of irreversible and heavy damage to the climate system associated with non-CDR geoengineering, according to a wide body of literature. Example: https://climate.envsci.rutgers.edu/pdf/20Reasons.pdf	Rejected. We currently say "significant, uncertain side effects" and are extremely space constrained in the level of detail we can go into about SRM and CDR in Ch 1	Lorenzo Campus	Ca' Foscari University of Venice	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
72399	37	29	37	29	2 important points: 1. Here or elsewhere, introduce EEI and quote e.g. von Schuckmann 2016, 2020. I would significantly strengthen analysis to introduce and use EEI / concentrations metrics more systematically, to reflect relevant forcing dynamics. 2. Add: "To address these uncertainties while mitigating the risk of space-based SRM, ideas for land and ocean-based alternatives SRM should be developed with urgency, including simple mirror technologies. These technologies bear parallels to existing solar photovoltaics (PV) or concentrated solar power (CSP), potentially making development and deployment within the coming years a realistic option. The feasibility and timescales of deployment of such low-risk SRM technologies must be addressed with urgency to restore Earth's energy imbalance (EEI) and avoid thermal overshoot beyond biological adaptability limits at planetary scale. It is of vital importance to reflect the decadal time lags inherent in the carbon cycle, which affect the potential contributions of mitigation and CDR measures to protecting Earth's ecosystems and slow the rate of tipping points (Lenton 2019)."	Rejected, beyond scope of this paragraph	Paul Maidowski	Fletcher School, Tufts; indepe	Germany
72401	37	29	37	29	Add reference(s): Schuckmann, Karina von et al. 2020. "Heat Stored in the Earth System: Where Does the Energy Go?" Earth System Science Data 12: 2013–41. doi: 10.5194/essd-12-2013-2020. von Schuckmann, K. et al. 2016. "An Imperative to Monitor Earth's Energy Imbalance." Nature Climate Change 6(2): 138–44. http://dx.doi.org/10.1038/nclimate2876 .	Unclear what the direct relevance of this reference is	Paul Maidowski	Fletcher School, Tufts; indepe	Germany
80191	37	29	37	29	Uncertainties in SRM-related processes are common to processes related to climate sensitivity more generally. SRM-related processes are not unique, unusual, or uncommon - instead, they are simply "normal" climate processes that have been identified as targets for manipulation. Limitations in current understanding of these climate processes in the context of SRM should not be distinguished or assessed differently than they are assessed in the context of human and natural (i.e., volcanic) influences on the climate system more broadly. Proposed edit: "Understanding of the climate response to SRM remains subject to large uncertainties, though these uncertainties are common to all projections of climates not historically experienced."	Rejected. Contemporary assessments by the scientific community agree that uncertainties about SRM are substantially larger than for other aspects of climate and climate change, see eg AR6 WG1 or recent NASEM study committee report: National Academies of Sciences, Engineering, and Medicine. 2021. Reflecting Sunlight: Recommendations for Solar Geoengineering Research and Research Governance. Washington, DC: The National Academies Press. https://doi.org/10.17226/25762 .	Kelly Wanser	SilverLining	United States of America
43629	37	30	37	39	Perhaps the authors could also mention that technological change in one region could lead to reduction of emission in other regions due to cross-country technological spillovers (van den Bijgaart 2017; Hémons 2016). The authors could refer to more detailed discussion of this effect in ch 16.3.3.2.	We shortened this paragraph drastically due to shortage of space, but we made a reference to chapter 16.	Jan Witajewski-Baltvilks	University of Warsaw	Poland
22787	37	34	37	34	Concerning the term "appealing" we recommend to replace it with "might provide the opportunity"	We did not find the word "appealing" here.	Government of France	Ministère de la Transition éc	France
51953	37	34	37	34	Not clear what type of models are being referred to (IAMs or others).	We are not sure what this refers to. The paragraph on innovation has been drastically shortened.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
6905	37	41	39	6	In this section on finance, please consider including the actual funding flow from the various sources of climate finance as well as the gap between the needed finance and what is currently provided.	Referred across to Chapter 15	Debra Roberts	Ethekwini Municipality	South Africa
28487	37	41	39	6	I think this section could be bolder about the fact that the improved understanding of climate risk and increased transparency about it (despite more work to be done) is "compelling investors to reassess core assumptions about modern finance" and is also expected to lead to a "significant reallocation of capital". Quotes are from https://www.blackrock.com/us/individual/larry-fink-ceo-letter (year 2020). The follow up of this letter (in 2021) points to the fact that the pandemic has "driven us to confront the global threat of climate change more forcefully and to consider how it will alter our lives" and to a subsequent acceleration of the reallocation of capital. The same message also gets to the point of presenting the climate transition as "a historic investment opportunity". See https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter . Note also that all the above is framed into a context that also flags that major economies like the EU, China, Japan, and South Korea have all made historic commitments to achieve net zero emissions in 2020, and that the U.S. also committed to rejoin the Paris Agreement. I think this is worth being given greater consideration. Finally, it is clear that governments are also responding to the economic crisis induced by COVID-19 on a massive scale. In this context, several important call points to be considered for recovery plans to be conceived with a long term investment perspective, and therefore (inevitably) giving greater consideration of climate risks to ensure financial stability. Based on this, I think that it is really important here to flag that public spending (financed by debt) aimed to ensure economic recovery will very likely need to be conceived not only as an instrument to boost the economy in the short term, but also as a tool capable to address effectively the climate change challenge (along with other policy priorities: in particular creating long-term employment opportunities and reducing social inequalities). See for example: https://ccacoalition.org/en/blog/inclusive-green-recovery-possible-time-act-now , https://www.iea.org/commentaries/a-sustainable-recovery-is-within-our-reach-if-governments-act-now and https://www.iisd.org/sustainable-recovery/green-recovery-plans-can-unlock-millions-more-jobs-than-return-to-normal-stimulus/ . All this despite limited allocation of government spending to low-carbon activities so far (https://www.bloomberg.com/news/articles/2021-03-10/global-stimulus-spending-is-not-green-enough-yet), due to the need for a response that materialises over time (also to avoid inflation and supply chain crunches).	Accepted. The following sentence has been added to the end of the next paragraph: "Increased understanding and transparency of climate-related risks and opportunities is compelling the financial sector to question core assumptions and may lead to "significant" capital reallocation (Fink 2020)."	Pierpaolo Cazzola	International Transport Forum	France
53437	37	41	39	6	This section on "finance and investment" makes a case of greening finance, creating transparency, providing information about climate-related risk "so investors can make informed decisions" (p 38 line 15), manage risks and to mobilise capital for green and low-carbon investments. Do you really believe that finance don't "make the right decisions" because they lack information? ... The framing you offer here rather pampers international finance and financialisation, rather than challenging them as being ruthless and uncaring exploiters that benefit from destroying the climate. I could accept such a view from another body, but from the IPCC, in the year 2021, oh dear god... I fear the IPCC will get into serious legitimisation issues if you don't provide a more realistic representation of reality.	Rejected. The comment contains a value judgement and oversimplifies the role, methods and constraints of the financial sector. The complexities of mobilising climate finance are laid out in Chapter 15. Chapter 1 lacks the space and the remit to do this topic the justice it requires. Please note the section is now Section 1.4.4.	Elke Pirgmaier	University of Lausanne	Switzerland
2991	37	42	37	48	Recognition of links with state level dilemmas and some of the state-centric matters previously discussed is warranted here.	Rejected. The comment does not point to supporting literature that could provide clarification. The board point request would require additional text that is better placed in ch 15 and for which ch 1 does not have the space. Please note the section is now Section 1.4.4.	Beth Edmondson	Federation University	Australia
8223	37	42	39	6	I'm missing the angle of developed countries and the importance of private and public investments to mitigation of climate change also within the country. Currently this section focus solely on developing countries.	Accepted. The following text has been added: "Central banks and regulators likely have an important role in creating enabling environments for climate finance, especially post-Covid. Developed countries have seen increases in climate finance flows (for example, through issuance of green bonds (15.6.6). But future investment needs are greatest in emerging and developing economies (15.5.2) which already face higher cost of capital, hindering capacity to finance a transition (Ameli et al 2021; Buhr et al 2018). " Please note the section is now Section 1.4.4.	Frida Zahlander	DanChurchAid	Denmark

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
70289	37	46		48	95% of tracked climate finance goes toward mitigation (UNEP Adaptation Gap Report 2020). This should be mentioned.	Accepted. The following text was added to the end of the sentence: ", even though tracked climate finance overwhelmingly goes toward mitigation over adaptation (UNEP 2020) [15.3, Working Group II]". Please note the section is now Section 1.4.4	Philippe Tulkens	European Union (EU) - DG Re	Belgium
86433	38	5	38	5	Besides policy and technology, change in demand is also a major component of Transition Risk	Accepted. The sentence now reads: "policy, technology and behavioural changes". Please note the section is now Section 1.4.4	Lorenzo Campus	Ca' Foscari University of Veni	United States of America
82487	38	15		16	can reference Chenet et al 2021 https://doi.org/10.1016/j.eolecon.2021.106957 and Ameli et al 2019	Accepted. References added. Please note the section is no Section 1.4.4	Hugues CHENET	University College London	France
86435	38	16	38	16	"Transparency alone may be insufficient to enable the required asset reallocation." Excellent point. Examples of Principles Responsible Banking pilot programs on TCFD resulting in statements of low or absent risk to investments could be given, together with recent examples of TCFD rendition by financial institutions such as Citi Bank (2020), which, using a possibly incomplete approach, reported no substantial risk in debt assets or investee default.	Accepted. The sentence has been edited to read as follows: "transparency alone may be insufficient to enable the required asset reallocation in the absence of clear methodologies and regulatory framework". Lack of space and citable literature prevents inclusion of the suggested topics as it would require value judgements on the part of the authors. Please note the section is now Section 1.4.4	Lorenzo Campus	Ca' Foscari University of Veni	United States of America
43473	38	25	38	36	Given that the NDCs presented by the countries due to the Paris Agreement are not sufficient to limit the temperature rise to 2 degrees, It seems that the \$ 100 billion aid of developed countries is not sufficient and to pursue ambitious GHG reduction goals, it must be increased.	Rejected. IPCC guidance is to avoid the use of policy prescriptive terminology such as "should", "must", "ought". Authors are tasked with assessing the literature without offering policy suggestions. Please note the section is no Section 1.4.4	sadegh zeyaeayan	Head of national center for fo	Iran
50379	38	25	38	36	Given that the NDCs presented by the countries due to the Paris Agreement are not sufficient to limit the temperature rise to 2 degrees, It seems that the \$ 100 billion aid of developed countries is not sufficient and to pursue ambitious GHG reduction goals, it must be increased.	Rejected. IPCC guidance is to avoid the use of policy prescriptive terminology such as "should", "must", "ought". Authors are tasked with assessing the literature without offering policy suggestions. Please note the section is no Section 1.4.4	Government of Iran	Islamic Republic of Iran Mete	Iran
64903	38	25	38	36	climate justice and moral obligation of Global North to Global South should be recognized in this paragraph. The narrative should highlight responsibility of the affluent for climate change crisis. Climate Fund stems from these injustices. Framing creation of the Fund as "help" for developing countries is misleading to what actually should be perceived as a moral (climate) obligation of developed countries towards developing. Obligation that stems from colonialism, extractivism and holding responsibility for climate change crisis. Not even once in the introduction this ("extractivism" and "colonialism") are mentioned.	Accepted. The sentence now reads: "At COP16 in Cancun, countries "established the Green Climate Fund (GCF) "as an operating entity of the Financial Mechanisms" under Article 11 of the UNFCCC to finance mitigation and adaptation efforts in developing countries (GCF 2020). Please note the section is now Section 1.4.4	Marta Baltruszewicz	University of Leeds	United Kingdom (of Great Britain and Northern Ireland)
22791	38	32	38	33	We suggest to rephrase "pledged USD100 billion a year by 2020," with" to mobilise 100 billion USD a year from public and private sources by 2020"	Accepted and amended Excerpt from Ch 15: "Section 14.3.2 of Chapter 14 provides a further assessment of progress and challenges of financial mechanisms under the UNFCCC, notably the GCF."	Government of France	Ministère de la Transition éco	France
6907	38	33	38	44	This reference is inappropriate. You cannot have a 2003 reference for SDG-related content.	Accepted. The reference supports the statement that exchange rate volatility affects infrastructure development in general. The reference to the SDGs has been removed. PPlease note this section is now Section 1.4.4.	Debra Roberts	EThekwini Municipality	South Africa
7943	38	37	38	39	Where are the sources to support the statements made in this sentence?: "Development bank and climate funds are inadequate to provide the scale of financial flows to achieve 38 sustainable development. Long-term sources of private capital are required to meet financing needs 39 across sectors and geographies." Surely, there are also opposing views on the role of public and private financial flows to meet financial needs for mitigation. E.g. Modern-Money theorists would argue for a Keynesian approach where the state creates money needed to finance the transition (this is just one example)	Accepted. These sentences have been edited and now read as: "Although public financing is expected to play an important role, governments may lack capacity to singlehandedly underwrite the transition (15.6.7), especially low-income developing countries with debt sustainability concerns and poor access to global financial markets. Long-term sources of private capital are required to meet financing needs across sectors and geographies. Requisite North-South financial flows are impeded by both geographic and technological risk premiums (Buhr et al. 2018; Iyer et al. 2015) (15.2.1)and face short-term headwinds in post-Covid circumstances (15.6.3). Long-term sources of private capital are required to close the financing gap across sectors and geographies (15.6.7)." Please note this section is now Section 1.4.4.	Jevgeniy Bluwstein	University of Fribourg	Switzerland
30645	38	37	38	38	This sentence sounds negative. It would be better to rewrite it as "Development bank and climate funds leverage the scale of financial flows to achieve sustainable development"	Accepted. These sentences have been edited and now read as: "Although public financing is expected to play an important role, governments may lack capacity to singlehandedly underwrite the transition (15.6.7), especially low-income developing countries with debt sustainability concerns and poor access to global financial markets. Long-term sources of private capital are required to meet financing needs across sectors and geographies. Requisite North-South financial flows are impeded by both geographic and technological risk premiums (Buhr et al. 2018; Iyer et al. 2015) (15.2.1)and face short-term headwinds in post-Covid circumstances (15.6.3). Long-term sources of private capital are required to close the financing gap across sectors and geographies (15.6.7)." Please note this section is now Section 1.4.4.	Government of Japan	Climate Change Division - Mi	Japan
6909	38	45	38	45	What are deep decarbonisation scenarios? Why not explicitly state the RCP or the SSP scenarios?	Accepted. The sentence now reads: "Scenarios delivering stringent mitigation outcomes (e.g. net-zero or 1.C) see investments into fossil power generation technologies (including those with CCS) decrease by more than half by 2030 (IEA 2019c)." Because deep decarbonisation is not limited to SSP-RCP combinations, we opted for a more general approach. Please note the section is now Section 1.4.4.	Debra Roberts	EThekwini Municipality	South Africa
6911	38	47	38	49	It might be useful to specify the period of reported increased investment in coal-fired plants	Accepted. The statement has been made more general to be in line with the reference's broader focus than only applying to coal plants. It now reads as follows: "However, there was a surge of coal investments across 56 recipient countries in Asia and Africa, almost entirely is often a disconnect between stated national climate ambition and finance flows. For example, overseas direct investment (ODI) financial flows from donor countries may be at odds with national climate pledges such as NDCs. One report found funds supported by foreign State-Owned Enterprises, whilst private investment has flowed almost entirely into renewables into 56 recipient countries in Asia and Africa in 2014-2017 went mostly to fossil fuel-based projects not strongly aligned with low-carbon priorities of recipient countries' NDCs (Zhou et al. 2018)." Please note this section is now Section 1.4.4.	Debra Roberts	EThekwini Municipality	South Africa
14465	38	47	38	49	"There was a surge of coal investments..." When was this? Please give timeframe. It is important.	Accepted. The statement has been made more general to be in line with the reference's broader focus than only applying to coal plants. It now reads as follows: "However, there was a surge of coal investments across 56 recipient countries in Asia and Africa, almost entirely is often a disconnect between stated national climate ambition and finance flows. For example, overseas direct investment (ODI) financial flows from donor countries may be at odds with national climate pledges such as NDCs. One report found funds supported by foreign State-Owned Enterprises, whilst private investment has flowed almost entirely into renewables into 56 recipient countries in Asia and Africa in 2014-2017 went mostly to fossil fuel-based projects not strongly aligned with low-carbon priorities of recipient countries' NDCs (Zhou et al. 2018)." Please note this section is now Section 1.4.4.	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
48165	38	47	39	1	The reference source (Zhou et al., 2018, https://www.wri.org/publication/moving-the-green-belt) seems to have failed, if there is no way to update the reference source, suggest to delete this sentence.	We have updated the link to the correct source. Thank you for raising this to us. Please note the section is now Section 1.4.4	Yang Wang	Beijing Climate Center	China

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
77185	39	1	39	3	The sentence seems to complain that investments are made on hydropower, associating it to "non-renewables", while this is one of the most effective non-GHG-emitting sources...	True. However, we are simply using the same terminology used in the underlying reference. They do not explain how they defined "non-renewables". Also, it can't be surmised from the figures and tabs if it implies anything that is not wind, solar, geothermal since they also include an unspecified category called "Multiple/Other renewables". Please note this section is now Section 1.4.4.	Giacomo Grasso	ENEA	Italy
65645	39	2	39	3	"[...] with public-sector lending used mainly in non-renewable and hydropower projects." Specify what "non-renewable" means. If the term refers to fossil sources only, then say so. If it includes nuclear power, then state it separately and express it in a positive tone as nuclear demonstrably reduces emissions. Most likely the term "non-renewables" in this context refers to fossil fuels. The MDBs, for some reason, do not encourage financing nuclear power (see Table A5.1 in https://www.cgdev.org/sites/default/files/multilateral-development-banking-report-five-recommendations.pdf). The IPCC should comment on this issue.	Rejected. While this may be true, we are simply using the same terminology used in the underlying reference. They do not explain how they defined "non-renewables". Also, it can't be surmised from the figures and tabs if it implies anything that is not wind, solar, geothermal since they also include an unspecified category called "Multiple/Other renewables". In addition, the reference used assessed 10 MDBs, 5 of which are not included in the linked document provided by the comment, so it is not clear what their policies are. Because of this, Chapter 1 is not the place for a commentary on what MDBs do. Such a commentary would be better placed in chapters 6, 14 or 15. Please note this section is now Section 1.4.4.	Eero Hirvijoki	Aalto University	Finland
69911	39	6			I would suggest mention here the "Poseidon principles" adopted by 22 leading banks operating in the maritime sector to push for its decarbonisation.	Rejected. Thank you for the suggestion. Although useful, lack of space prevents us from properly contextualising the principles. Also, would raise questions as to why include these and not other initiatives (we cut several from previous drafts).	Cédric PHILIBERT	Institut Français des Relations Internationales	France
4731	39	8	39	8	The role of social movements like the pipeline protests, sunrise movement, student strikes etc surely deserves mention here. As Kate Aronoff said of the Keystone Pipeline decision: protest is a market signal.	Thank you, the comment is a good one although would need a fair bit of space to substantiate properly. Cross-reference to 1.7.6, where such social movements are discussed is made.	Julia Steinberger	University of Lausanne	Switzerland
7947	39	8	40	6	The entire section 1.5.5 (Political Economy) misses an important analytical implication stemming from a political economy analysis of climate change and mitigation action. Political economists who emphasize the role of capital accumulation as the central driver of economic activities, highlight how negative externalities of capital accumulation (e.g. GHG emissions) cannot be fully - or at least to the extent that significant climate mitigation action is achieved - internalized through economic policy instruments because such internalization if complete, or at least significant - would render business models economically unsustainable and capital accumulation impossible. In other words, externalization is a feature of capital accumulation, not a bug. Significant internalization (what we need for climate mitigation), in other words, would get us beyond capitalism as we know it into a political economy that one could call post-capitalist. However, current political economic structures - which are in place to shore up capital accumulation interests and to prevent the devaluation of assets for future capital accumulation - are in the way of this radical transition. These are some of the central aspects in thinking about political economy of climate change that should be included in section 1.5.5	This is a very well-made point but would require a good deal of exposition (as in the comment itself). There is no reference provided either and I am not aware of work that makes this point explicitly (perhaps Bellamy Foster or similar, but it'd take a long time to find). I had a look at the commenter's own work which doesn't provide obvious citations. So it would be hard to incorporate without appropriate citations to support it.	Jevgeniy Bluwstein	University of Fribourg	Switzerland
22793	39	8	39	8	We suggest to consider adding, (e.g. in the third paragraph of this section), something about the fact that fossil energy-related interest groups may have the advantage that they face lower organizational and lobbying costs than groups which benefit from climate policy. Interests in favor of climate action may be more diffuse, more broadly spread than well-organized fossil energy interests. See for instance Meng and Rode (2019) who found that lobbying by firms expecting losses from climate policy was more effective than lobbying by firms expecting gains from it.	Good addition, thank you. Incorporated into para 119.	Government of France	Ministère de la Transition Écologique et Solidaire	France
28489	39	8	40	6	I think the first three paragraphs are good here, but also that the fourth falls short of flagging that there can indeed be advantages from climate policy to succeed in meeting policy goals that go beyond those directly related with the need to address climate change, in particular industrial development and job creation. See for example here, on batteries, e-mobility and related materials: https://secureenergy.org/commandingheights/ Due to geopolitical factors (and in particular the capacity that China demonstrated to bring down costs of key low-carbon technologies, not only but in large part thanks to scale), this is also something that has been gaining a lot of attention from a geopolitical perspective. See for example: https://www.csis.org/analysis/industrial-policy-trade-and-clean-energy-supply-chains . I think considerations on increased competition and influence, as well as their impacts on jobs, could be more elaborated here, since they can be an important driver of change, favoring decoupling, and also a development that, to deliver effectively on climate, is likely to require policy action.	This point was implied in the last sentence in paragraph 120, but has been made explicit now.	Pierpaolo Cazzola	International Transport Forum	France
7945	39	9	39	20	This paragraph tries to give a broad definition of "political economy" while failing to mention the most central aspect of a political economy approach: capital accumulation. I would highlight that from a political economy perspective to climate change and mitigation, attention to capital accumulation as the central driver for economic activities is paramount. What is already referred to as "central role of structures of power" is another way to say in the abstract form that capital accumulation (the necessity to generate profits from economic activities in capitalism) structures economic activities.	Have added this in para 117 alongside 'economic growth'. The two are technically different but of course inter-related processes, there isn't space I think to expand on the specific logics of capital accumulation here.	Jevgeniy Bluwstein	University of Fribourg	Switzerland
14467	39	9	39	20	It would also be useful to mention how the assumption that fossil fuel exploitation is necessary for development has become a powerful narrative that is difficult to counter. Strambo and Espinoza explain this well in their paper on fossil fuel narratives in Colombia: Claudia Strambo & Ana Carolina González Espinoza (2020) Extraction and development: fossil fuel production narratives and counternarratives in Colombia, Climate Policy, 20:8, 931-948, DOI: 10.1080/14693062.2020.1719810. It would also be useful to discuss the resulting problems of inertia, not only institutional but also cultural, in terms of long-established mindsets and routines that continue to prioritise fossil fuel development, even where there is no longer a strong economic case for this. Johnson et al discuss this here: Oliver W. Johnson, Peter du Pont & Cannelle Gueguen-Teil (2021) Perceptions of climate-related risk in Southeast Asia's power sector, Climate Policy, 21:2, 264-276, DOI: 10.1080/14693062.2020.1822771. Another important reference for this section (I have also suggested it for section 1.6.5) is Giorel Curran (2020) Divestment, energy incumbency and the global political economy of energy transition: the case of Adani's Carmichael mine in Australia, Climate Policy, 20:8, 949-962, DOI: 10.1080/14693062.2020.1756731	Thank you. This point and the Strambo/González reference has been incorporated into paragraph 118.	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
45435	39	10	39	10	"climate (in) action" should be "climate (in)action" [no space] as otherwise the meaning is different	Thank you	Elena Verdolini	University of Brescia and Eurac	Italy

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84527	39	11	39	11	Please insert the following reference "Edvardsson Björnberg et al. 2017" and add the following to the reference list: "Edvardsson Björnberg, K., Karlsson, M., Gilek, M. and Hansson SO. (2017) Climate and Environmental Science Denial. A review of the scientific literature published in 1990–2015. Journal of Cleaner Production 167, 229-241. https://doi.org/10.1016/j.jclepro.2017.08.066 ."	This article is not appropriate for the point being made in this sentence - it is about climate denial, which while one of the strategies deployed by actors with an interest blocking climate action, is not the only such strategy and the sentence is really making the more general point that these economic interests are important to understanding climate action. The existing references are sufficient for this claim.	Mikael Karlsson	KTH Royal Institute of Technology	Sweden
86437	39	21	39	23	Text seems to infer that the historical centrality of fossil energy to economic development is the "only" pathway to economic development, instead of being one of several possible development pathways that could have occurred. It is important again to stress that development for today's LDCs needs not to go through the same fossil-linked path to development that today's developed countries followed.	Thank you, the main point of the section is that the historical patterns and pathways really matter to understanding the possibilities for action - whether in principle it is the only pathway is not that important to the point here. But the comment is correct that for countries without established fossil fuel infrastructure the possibilities for low carbon development may be easier. This point has been made in paragraph 120.	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
72385	39	22	39	23	One could mention the empirical base for decoupling at global scale here (Kallis and Hickel 2020). But even more interesting to include the biophysical foundations may be to add energy perspectives: Fossil fuels' energy density allowed a level of activity and growth that cannot be permanently sustained with lower-EROI energy sources. As a balanced sentence to introduce the thermodynamic challenge, I'd suggest adding here (and frequently throughout the entire report) references like: "Economically, this is well understood as a problem of reducing primary energy consumption or the rates of energy dissipation, material throughput and GHG emissions through either decoupling or degrowth (Kallis and Hickel 2020; Hickel 2020)."	This point relates to a more narrowly economic understanding of the decoupling issue - the point made in this paragraph is about the political dynamics entailed. Propose to leave this here.	Paul Maidowski	Fletcher School, Tufts; independent	Germany
72389	39	22	39	23	add reference: Hickel, Jason. 2020. "What Does Degrowth Mean? A Few Points of Clarification." Globalizations September: 1–7. 10.1080/14747731.2020.1812222 .	It is not clear to me how this point and the article connects to the specific point in those lines about decoupling (see previous comment that this paragraph is not about the economics per se) or that about the political constraints on policy to pursue this. Hickel is associated with a set of 'political' arguments about degrowth to be sure but it seems tangential to the point here and more appropriate elsewhere.	Paul Maidowski	Fletcher School, Tufts; independent	Germany
27547	39	23	39	25	Delete "But the constraint is also political, in terms of the power of incumbent fossil fuel interests to block initiatives towards decarbonisation (Newell and Paterson 2010; Geels 2014; Jones and Levy 2009).", as this is not a policy-neutral statement.	We disagree. This statement makes no advocacy of particular policies, but simply explains why climate action in general has been limited. The references amply demonstrate this point (and many more could be cited in support of the point). We note also many comments asking in effect for more details and emphasis on this point. It is only not 'policy-neutral' in the sense that it assumes action to limit emissions is a good thing, which the entire IPCC report does.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
63205	39	28	39	30	This sentence implies that "windfall profit for big business" is a deliberate design feature of carbon markets. This is not supported by the citation (Newell and Paterson 2010), which actually describes windfall profits as a loophole/weakness in some carbon markets that governments seek to correct. While regulatory capture can occur in carbon markets, as in any government initiative, it is not correct to portray this effect as the default scenario.	The point about windfall profits is not central to the claim in this paragraph and the comment is correct that Newell and Paterson 2010 doesn't make the claim that windfall profits were a deliberate part of the policy design (although there is literature arguing this). point deleted.	Government of Canada	Environment and Climate Change Canada	Canada
19867	39	29	39	30	Delete "and windfall profit". Reason: The literature on international carbon markets does not substantiate windfall profits. Some national level emissions trading schemes initially generated some windfall profits but design changes eliminated these quickly. See Michaelowa, Axel; Shishlov, Igor; Brescia, Dario 2019 Evolution of international carbon markets: lessons for the Paris Agreement, in: WIREs Climate Change, 10, e613, DOI: 10.1002/wcc.61	see response to 63205. mention of windfall profits deleted. The commenter underplays ongoing evidence about such windfall profits however, see e.g. Hobbie, Hannes, Matthew Schmidt, and Dominik Möst, "Windfall Profits in the Power Sector during Phase III of the EU ETS: Interplay and Effects of Renewables and Carbon Prices", Journal of Cleaner Production, 240 (2019), 118066 < https://doi.org/10.1016/j.jclepro.2019.118066 >	Axel Michaelowa	University of Zurich	Switzerland
12905	39	32	39	32	Meckling and Nahm 2018], for example.remove for example no need	Thank you, done	Amanullah Amanullah	Department of Agronomy, University of Agriculture Faisalabad	Pakistan
27549	39	33	39	41	Delete "One factor limiting the ambition of climate policy has been the ability of incumbent industries to shape government action on climate change (Newell and Paterson 1998; Breetz et al. 2018; Jones and Levy 2009; Geels 2014). Campaigns by oil and coal companies against climate action in the US and Australia are perhaps the most well-known and largely successful of these (Brulle et al. 2020; Stokes 2020; Mildenberger 2020) although similar dynamics have been demonstrated for example in Brazil and South Africa (Hochstetler 2020). In other contexts, resistance by incumbent companies is more subtle but nevertheless has weakened policy design on emissions trading systems (Pinkse and Kolk 2012), limited the development of alternative fuelled automobiles (Wells and Nieuwenhuis 2012; Levy and Egan 2003), for example.", as this is not a policy-neutral statement.	We disagree. This statement makes no advocacy of particular policies, but simply explains why climate action in general has been limited. The references amply demonstrate this point, others have been added, and many more could be cited in support of the point. We note also many comments asking in effect for more details and emphasis on this point (e.g. 77711). It is only not 'policy-neutral' in the sense that it assumes action to limit emissions is a good thing, which the entire IPCC report does.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
77711	39	33	39	41	Given that corporate obstruction of climate action is arguably the greatest obstacle to decarbonisation and a great deal has been written about it, this paragraph really merits expansion and more citations. I have several suggestions split across four comments (this and the next three). First, the references in the middle sentence (lines 35-37) are very sparse and do not reflect the excellent work that has been done (often well before 2020) on fossil fuel industry (let alone wider corporate) obstruction of climate action. For example, while Mildenberger's Australian case study is excellent and certainly ought to be cited, this citation gives the impression that no Australians have written about climate politics in their own country. For excellent books (by Australian authors) that deserve mention here, I would recommend at a minimum: Phillip Chubb "Power Failure" (2014); Guy Pearce "High & Dry" (2007), Rebecca Pearce "Pricing Carbon in Australia", Declan Kuch "The Rise and Fall of Carbon Emissions Trading" (2015), and Pearce, McKnight & Burton "Big Coal: Australia's Dirtiest Habit" (2015). On the US, I'd also recommend Christian Downie's "Business Battles in the US Energy Sector" (2019).	Thank you for all of these suggestions - here and in the following comments. On this one, additional reference on Australia mentioned (not possible to include all for space reasons).	Fergus Green	Utrecht University	Netherlands
77713	39	33	39	41	There is certainly merit in highlighting the US and Australia as examples of public-facing obstruction tactics, however Canada is missing here, as similar dynamics are at play there (see, e.g., Kathy Harrison's work), and the three countries are often grouped given they have a significant degree of similarity in terms of fossil endowments and institutions (competitive, liberal-market, high-income political-economies—see below comment on varieties of decarbonisation / CPE). Other missing countries include Norway (e.g. the work of Bang & Lahn 2020 in Climate Policy and refs there cited, and Mildenberger 2020), Germany, China, India and many others with major fossil fuel endowments and interests.	This is a good point that limiting it to the US and Australia might make it seem like a limited phenomenon. additional countries and references added. There are space limits that preclude mentioning all of these proposed.	Fergus Green	Utrecht University	Netherlands

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77715	39	33	39	41	Much corporate obstructionist activity, especially in the liberal-market economies, covers the full spectrum of overt/covert tactics, hence it is somewhat misleading to say “in other contexts” the activity is subtle / behind the scenes (e.g. in the US and Australia industry groups and corporations both ran PR campaigns AND lobbied heavily behind the scenes to shape legislative design, among many other obstructionist tactics). Furthermore, a wider array of corporate obstructionist tactics deserve mention here. E.g. there’s Exxon and the wider fossil fuel industry’s decades long social influence campaign to cast doubt on climate science, amply documented by Oreskes and Conway, Supran & Oreskes, Brulle, Franta and others. And no mention is made of fossil fuel industry suppression of direct popular resistance against fossil fuel operations through surveillance, intimidation, litigation, violence and even killings of activists, especially indigenous activists (see Scheidel, et al. 2020; Nosek 2020) and the wider fossil fuel industry’s role in wider efforts to shrink the space for civil society activism through regressive law reform (Amnesty International has done a lot on this). While the fossil fuel sector certainly merits special attention, they are hardly the only forces in the obstructionist coalition. The key US paper on this is Cory, Lerner & Osgood (2020) in AIPS. No doubt there is work on the German auto industry, etc. etc.	Thank you. We are not sure it is crucial to detail all the activities of these companies and sectors - the point of this section is simply to demonstrate that they have acted in various ways to undermine climate policy, and have often been successful in doing so. So we do not propose to add to the existing evidence in this regard.	Fergus Green	Utrecht University	Netherlands
77717	39	33	39	41	This paragraph is also missing the importance of comparative political economy and the argument that cross-national institutional variation explains different strategies and tactics of firms as well as the timing and content of policy outcomes (key works here include: Jared Finnegan’s 2019 Grantham Institute working paper “Institutions, climate change, and the foundations of long-term policymaking”; Wood et al. 2020, “The comparative institutional analysis of energy transitions”; and Mildemberger 2020).	Institutional variation across countries is discussed in 1.7.6. propose to leave that there for reasons of space.	Fergus Green	Utrecht University	Netherlands
85737	39	34	39	38	Suggest deleting this political viewpoint made to seem factual: ‘One factor limiting the ambition of climate policy has been the ability of incumbent industries to shape government action on climate change (Newell and Paterson 1998; Breetz et al. 2018; Jones and Levy 2009; Geels 2014). Campaigns by oil and coal companies against climate action in the US and Australia are perhaps the most well-known and largely successful of these (Brulle et al. 2020; Stokes 2020; Mildemberger 2020) although similar dynamics have been demonstrated for example in Brazil and South Africa (Hochstetler 2020).’	We disagree. This paragraph is entirely factual and based on extensive empirical research which is cited, others have been added, and many more could be cited in support of the claim. We note also many comments asking in effect for more details and emphasis on this point (e.g. 77711).	Government of Australia	Department of Industry, Science and Energy	Australia
14469	39	39	39	39	This paper provides a great, and more recent, illustration of the point made about incumbent companies seeking to weaken ETS design Jochen Markard & Daniel Rosenbloom (2020) Political conflict and climate policy: the European emissions trading system as a Trojan Horse for the low-carbon transition?, Climate Policy, 20:9, 1092-1111, DOI: 10.1080/14693062.2020.1763901	Thank you, reference added to replace Pinkse and Kolk which is older.	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
22795	39	40	39	40	Please consider replacing ‘limited’ by ‘limiting’	Thank you this has been corrected	Government of France	Ministère de la Transition écologique et solidaire	France
5197	39	41	39	41	Add a sentence at the end of paragraph. “It must be also observed that political decisions by governments have to take into account contradictory constraints, leading sometimes to major differences between official speeches and actual action. As such, the same government may promote the Paris Agreement, display a very green attitude, and continue to invest in coal fired plants.	We do not think this is appropriate or necessary here. Multiple pressures on governments are obvious - this section is about the political economy pressures specifically.	Michel SIMON	Retraité/ Pdt d’association	France
62097	39	41	39	41	Please add after “... for example”: In the past, the action of interest groups has led to distortions of mitigation policy instruments that reduced their effectiveness. Under favourable lobbying constellations strong subsidy schemes for mitigation can emerge. Renewable feed-in tariffs in Europe persisted for over two decades and were crucial for the breakthrough of wind and solar power technologies. But once competition from China led to the demise of European technology providers and the European population started to feel the pinch from the surcharges on their electricity bills, feed-in tariffs were abolished. Historically, rapid transformations of the nature required to reach 1.5°C built on either lavish public investment into the underlying infrastructure or a general notion of national emergency (Michaelowa et al. 2018).” New reference: Michaelowa, Axel; Allen, Myles; Fu Sha (2018): Policy instruments for limiting global temperature rise to 1.5°C – can humanity rise to the challenge?, in: Climate Policy, 18, p. 275-286).	Reference incorporated into next paragraph where it is more appropriate to focus on how political economy dynamics suggest particular types of policy design may aid coalition formation.	Axel Michaelowa	University of Zurich	Switzerland
10199	39	42	39	44	The point being made here is repeated at the end of the paragraph almost verbatim (starting with “Balancing such forces...”).	Thank you. the final sentence has been edited in response but also in response to other comments, so this repetition no longer is an issue.	Gary Kendall	Nedbank	South Africa
28491	39	42	40	6	The first and last sentence of this paragraph are essentially the same message, repeated.	Thank you. the final sentence has been edited in response but also in response to other comments, so this repetition no longer is an issue.	Pierpaolo Cazzola	International Transport Forum	France
53439	39	42	39	43	I suggest to make the role of social movements more explicit here, and their evidence-based potential to bring about fundamental social changes (e.g. Engler & Engler 2016. This is an Uprising, Bold Type Books, New York.	This has been added in, with a cross-reference to 1.7.6 where there is fuller discussion of social movements	Elke Pirgmaier	University of Lausanne	Switzerland

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77719	39	42	40	6	This paragraph struck me as slightly odd. The first and last sentences say almost exactly the same thing, and sandwiched in the middle is a sentence that lumps together a lot of very different obstructionist processes and actors: SOEs, groupings of states, and citizen support. Surely SOEs should be mentioned in the previous paragraph that focuses on corporate obstruction (and that previous paragraph needs to be better linked to the current paragraph, since the current paragraph read alone gives the impression that non-SOE corporations are not part of the obstructionist forces). It is not clear how groupings of states in international negotiations fits in here—it seems like quite a separate (external) influence on climate policy rather than a matter of the internal political economy (of course, they are linked, but it deserves separate treatment). And patterns of citizen support/opposition also merit distinctive treatment—e.g. this PE-focused section might focus on citizen "mobilisation" (distinguishing this from public opinion; "patterns of support/opposition" is ambiguous about whether the latter are intended to be included), since citizens' anti-climate mobilisations are not usually for the same baldly strategic motivations as companies (and state actors). Rather, citizen anti-climate mobilisations are often motivated by wider—often quite legitimate—grievances (e.g. socioeconomic inequality, exclusion from decision-making, concerns about distributional effects of climate policy, etc.—as with the Yellow Vests) that are in principle able to be addressed through policy design more democratic and systematically transformative policy programmes that address systemic inequalities, poverty, and the erosion of good jobs and conditions. Of course, some "grass-roots" mobilisations are actually conformed or nurtured by fossil capital interests (e.g. the role of the Koch brothers in the Tea Party movement in the US) and this too should be acknowledged.	This is an excellent point, thank you. We have separated out these two issues and restructured the paragraph into two.	Fergus Green	Utrecht University	Netherlands
50107	39	44	39	46	In addition to the factors mentioned, factors such as physical/geographical constraints that countries face could also limit opportunities for emissions reduction.	The point of this section is to elaborate the logic of political economy approach, not discuss all factors shaping constraints on policy. Propose to leave this aside.	Government of Singapore	Ministry of Sustainability and	Singapore
22797	40	3	40	4	This example is not relevant here since it did not lead to France changing its stance on climate action both nationally and internationally. Also, the Citizen Assembly on climate change showed that there is a strong support from citizen for climate action as long as social justice issues are being handled as well. Finally, the literature on which this statement is based does not seem robust or consensual enough. The yellow vest movement was a general protest about declines in per capita wealth (sparked by another additional tax), rather than against the climate policy per se (this was adequately mentioned above p.20). We therefore suggest to delete the part in between the parentheses ("with...example")	phrase deleted.	Government of France	Ministère de la Transition éc	France
22799	40	4	40	5	For the sentence "Balancing such forces typically involves building coalitions of actors to legitimise climate policy in the face of such opposition (Meadowcroft 2005; Levin et al. 2012; Meckling 2011)." It could also be added that the Paris Agreement recognises the imperative of a just transition of the workforce and the creation of decent work and quality jobs making link with discussion 1.6.3.2 and elsewhere	This section is elaborating the logic of a political economy approach, not convinced specific mention of the PA here is necessary.	Government of France	Ministère de la Transition éc	France
86439	40	4	40	6	The exact same sentence appears in the previous page: Page 39, Lines 42-44. (In choosing where to cut it, I think it sounds better to leave it at the end of the paragraph, instead of at the beginning).	Thank you. The paragraph has been rephrased generally and this issue no longer exists.	Lorenzo Campus	Ca' Foscari University of Veni	United States of America
48631	40	8	41	5	Section 1.5.6 focuses on equity and fairness between countries rather than including these as people-centred principles; refer to AR5 quote cited on p. 9 that includes people as well as countries as having rights to justice, equity and fairness; references on p. 13 to consequences of concern to people about equitable sharing of risks; p. 17 and refs to climate change being 'devastating for the most vulnerable'; p. 28 and JT not resulting in imposition of hardship on already marginalised populations; in light of these and other observations across the chapter, suggest refs to the climate justice literature in this section eg David Schlosberg and Lisette B. Collins 'From environmental to climate justice: climate change and the discourse of environmental justice' WIREs Climate Change, 5(3) 2014, pp 359-75; David Scholsberg, "Climate Justice and Capabilities: A Framework for Adaptation Policy", Ethics & International Affairs 26(04) 2012; or any other sources on climate justice	We have included more on national policies now, but to avoid overlap, we do not refer to the climate justice literature here. This is discussed in 1.8.2.	Lorraine Elliott	The Australian National Univ	Australia
80913	40	10	40	10	"highlights" instead of "highlight"	Thank you for raising this	Heinz Wittenbrink	FH Joanneum University of A	Austria
14471	40	13	40	15	I would rephrase. We already have a "significant global agreement", indeed, three of them. Perhaps say "Equity issues are important reasons why it has proved hard to agree.."	Accepted	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
12907	40	18	40	18	(see, e.g., chapters 3 and 4). Write Chapter also remove the word see	Accepted	Amanullah Amanullah	Department of Agronomy, Th	Pakistan
4733	40	22	40	23	See Millward-Hopkins & Oswald on fair inequality and its implications for redistribution and emissions. https://iopscience.iop.org/article/10.1088/1748-9326/abe14f	Rejected. I agree that the paper is interesting, but its focus is not on experimental economics and acceptance of unfair distributions.	Julia Steinberger	University of Lausanne	Switzerland
22801	40	28	40	30	a reference to the Kayal et al. (2019) paper discussing these issues can be added in this sentence. REF: Kayal M, Lewis H, Ballard J, Kayal E. 2019. Humanity and the 21 st century's resource guntlet: a commentary on Ripple et al.'s article "World scientists' warning to humanity: a second notice". Rethinking Ecology 4:21. https://doi.org/10.3897/rethinkingecology.4.32116	Rejected. This paper is a response to another paper and not a major reference on this issue.	Government of France	Ministère de la Transition éc	France
22803	40	28	40	29	Concerning the statement "rich and poor countries", while the opposition between rich and poor countries is relevant in a first approach, addressing the issue of equity and justice requires to change scale in order to grasp the strong inequalities that exist within countries. It would be important here to explicitly introduce the notion of vulnerability in order to distinguish between physical exposure to climate change impacts and social sensitivity, both individual and collective, to these impacts. This sensitivity is certainly a function of physical disturbance intensity, but it is above all closely correlated with vulnerability which is rooted in social inequalities. This helps to explain why within a country, even a rich one, it is the poorest who are most at risk and to make the link with injustice.	Accepted. We added a little bit more on the role of existing inequalities for vulnerability within a country.	Government of France	Ministère de la Transition éc	France

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14473	40	32	40	35	"Their infrastructure is also in a poorer condition". This is simplistic. Please make the point in a more nuanced way. "There is a lack of political representation at the world stage for many of these communities". So you are talking about communities now, not countries? Please be specific. Low-income "countries" have, at least in principle, as many opportunities for political representation in the climate change regime as higher income ones do. I don't see any discussion of representational issues in section 1.6.3.2 that is cross-referenced. What do you mean by "women, especially in poor countries, are often less adaptive to climate change"?	We changed the sentence on infrastructure, and deleted the sentence on political representation. When it comes to women and adaptation to climate change, we refer to the studies mentioned in the text.	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
77721	40	33	40	34	"within a country, the burden may not be equally distributed". This grossly understates the evidence of highly unequal impacts of climate change and, more generally natural disasters (not to mention other kinds of shocks, like pandemics!) within countries. While gender is (rightly) mentioned in the next section, one cannot ignore differences in vulnerability and adaptive capacity due to income & wealth, race, and various other factors. Consider, e.g., the Environmental Justice work on Hurricane Katrina, work on flooding in the UK (Lindley et al. 2011 report for the Joseph Rowntree Foundation) and no doubt much other work of relevance here (the authors should cross-check this with WGII findings).	Accepted.	Fergus Green	Utrecht University	Netherlands
17281	40	34	40	35	The use of the phrase 'women, especially in poor countries, are often less adaptive to climate change' here reads awkwardly and is not commonly used in literature on 'gender and climate change'. The issue is less than women cannot adapt to climate change, and more than unequal social structures can result in women being more vulnerable to the worst effects of climate change compared to men (see, Arora-Jonsson, 2011; Denton, 2002; Neumayer and Plümper, 2007; Terry, 2009). Phrasing it as women are less adaptive invisibilises the socially constructed nature of women's vulnerability and should be clarified. Also, to say 'gender matters' but only point to the inadequacy of women suggest men as the norm to which women deviate. Women are only vulnerable in relation to men's invulnerability, and can only be understood through this dualism. Citations: Arora-Jonsson, S., (2011). 'Virtue and vulnerability: Discourses on women, gender and climate change', <i>Global Environmental Change</i> , 21, pp. 744–751. doi: 10.1016/j.gloenvcha.2011.01.005. Denton, F., (2002). 'Climate Change Vulnerability, Impacts, and Adaptation: Why Does Gender Matter?', <i>Gender and Development</i> , 10(2), pp. 10–20. doi: 10.1080/13552070215903. Neumayer, E. and Plümper, T., (2007). The gendered nature of natural disasters: the impact of catastrophic events on the gender gap in life expectancy, 1981–2002. <i>Annals of the Association of American Geographers</i> , 97 (3), pp. 551-566. Terry, G., (2009). 'No climate justice without gender justice: An overview of the issues', <i>Gender & Development</i> , 17(1), pp. 5–18. doi: 10.1080/13552070802696839.	Accepted.	Joanna Flavell	University of Manchester	United Kingdom (of Great Britain and Northern Ireland)
12909	40	39	40	39	Edmonds et al.) year is missing	Thank you this has been corrected	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
62039	40	39	40	39	There is already an earlier paper on this topic: Hof, A.F., den Elzen, M.G.J., Admiraal, A., Roelfsema, M., Gernaat, D.E.H.J., van Vuuren, D.P., 2017. Global and regional abatement costs of Nationally Determined Contributions (NDCs) and of enhanced action to levels well below 2 °C and 1.5 °C. <i>Environmental Science & Policy</i> 71, 30-40	Accepted.	Michel den Elzen	PBL Netherlands Environmental Assessment Agency	Netherlands
77723	40	40	41	5	The last two paras of this section discuss only international transfers as means of redressing equity (rightly noting the challenges), while ignoring the scale of economic inequality within countries and the for potential climate action (both mitigation and adaptation) within countries to be supported through progressive tax reform. This is a glaring omission, given the scale of economic inequalities and the attention they are now rightly getting in the economics community (see e.g. the World Inequality Report: Alvaredo et al. 2018). Concerns about risks of capital flight are likely overblown—at least as far as individual natural persons are concerned (see Young, "The Myth of Millionaire Tax Flight" 2017). To the extent concerns about tax flight and evasion are warranted, this suggests the urgent need for international cooperation to introduce registers of assets and beneficial ownership, and tax floors e.g. on corporate income tax, personal income tax, wealth etc.—something many experts have been calling for on other grounds but that warrant much greater attention within climate policy circles (see, e.g., Jessica F. Green, "Beyond Carbon Pricing: Tax Reform Is Climate Policy", <i>Global Policy</i> , 2021). In short, the larger worry is that the section focuses too much on intractable equity debates within international negotiations and ignores the immense potential for progressively financed climate action within countries, and through alternative modes of international cooperation.	Accepted. We added a sentence and a reference on national policies.	Fergus Green	Utrecht University	Netherlands
4197	40	41	40	41	criteria --> criterion [criteria is plural]	Thank you	Marcel Wissenburg	Radboud University Nijmegen	Netherlands
4899	40	41	40	41	Nitpick: should read "...there is no single universally accepted set of equity criteria, ..." Singular usage fits with a singular thing -- a set. But the set contains multiple criteria, each of which is a criterion, as in "countries may strategically choose a criterion that favours them."	Thank you	Harry Saunders	Carnegie Institution for Science	United States of America
14475	40	45	40	47	"A climate treaty..." what climate treaty? Do you mean the Paris Agreement? "Such a treaty" (which one?) "will likely involve transfers from rich to poor countries..." - why is the reference to UNFCCC, 2010? The obligation on developed countries to provide financial assistance to developing ones was established in the 1992 UNFCCC itself.	We write about a climate treaty in general, but changed the reference to UNFCCC (1992).	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
9843	40				Excellent and important notes on equity showcasing between rich and poor countries as well as people. Addressing such equity through transfers among countries suggest neoliberalism, unsurprising as it is, however how to address equity between people and gender wise is still a big question.	Noted.	Government of Indonesia	Ministry of Environment and Forestry	Indonesia
2055	41	6	41	14	This discussion fails to engage with the robust sociological literature that connects individual identity, institutional processes, and cultural beliefs that impact climate behavior. This paragraph needs to be expanded and updated to reflect the current peer reviewed literature in this area (see references below).	the section has been revised in accordance with the general tenor of this point. Some of the references below have been incorporated as well as additional sociological literature, especially 'practice theory' literature on sustainable consumption. The choice here has been shaped by the focus of the section on individual/social consumption so more institutional/corporate literature has not been addressed here (although of recognising all these different aspects are inter-related).	Robert Brulle	Brown University	United States of America
2057	41	6	41	14	Brulle, R. J., & Norgaard, K. M. (2019). Avoiding cultural trauma: Climate change and social inertia. <i>Environmental Politics</i> .	reference incorporated	Robert Brulle	Brown University	United States of America
2059	41	6	41	14	Kasper, D. <i>Ecological Habitus. Organization & Environment</i> 22(3):311-326.	reference left out	Robert Brulle	Brown University	United States of America
2061	41	6	41	14	Kurtz, T. B. Gardner, B. Verplanken, and C. Abraham. 2015. Habitual behaviors or patterns of practice? <i>WIREs Climate Change</i> , 6:113-128.	reference incorporated	Robert Brulle	Brown University	United States of America

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2063	41	6	41	14	Lucas, C., Leith, P. and Davison, A., 2014. How climate change research undermines trust in everyday life: a review. <i>Wiley Interdisciplinary Reviews: Climate Change</i> , 6(1), pp.79-91.	reference left out	Robert Brulle	Brown University	United States of America
2065	41	6	41	14	Norgaard, K. M. (2011). <i>Living in denial: Climate change, emotions, and everyday life</i> . MIT Press.	reference incorporated	Robert Brulle	Brown University	United States of America
2067	41	6	41	14	Rickards, L., Wiseman, J. and Kashima, Y., 2014. <i>Barriers to effective climate change mitigation</i> Wiley Interdisciplinary Reviews: Climate Change, 5(6):753-773.	reference incorporated	Robert Brulle	Brown University	United States of America
2069	41	6	41	14	Rosenschold, J., Rozema, and L. Frye-Levine 2014. Institutional inertia and climate change: a review of the new institutionalist literature. <i>WIREs Climate Change</i> 5:639-648	This would be more appropriate for 1.7.6, added there.	Robert Brulle	Brown University	United States of America
2071	41	6	41	14	Slawinski, N. J. Pinkse, T. Busch, and S. Banerjee. 2015. The role of Short-Termism and Uncertainty Avoidance in Organizational Inaction on Climate Change. <i>Business and Society</i> 1-30.	reference left out	Robert Brulle	Brown University	United States of America
5199	41	6	41	45	Add a paragraph stating the rôle of medias, shaping the public opinion. I propose something like : "In democratic countries where the media expression is free, those medias have major rôle to play, by giving more room in the news to the promotion of mitigation actions and improving the level of the technical information given to the public. In order to keep the attention of the public, the redaction too often give predominant importance to the details -true or not- which may scare or have emotional impact on the public, rather to factual information. In many countries, the nuclear sector have been disqualified in the public opinion by a constant propaganda by anti nuclear movement, relayed by the medias, forgetting the major rôle that nuclear energy must have to reduce GHG emissions in electricity or heat production systems."	Propose that we leave this aside. apart from the rather specific question about nuclear power, this comment is about public opinion, whereas the section is about behaviour change among individuals and social groups. these are not really the same set of issues.	Michel SIMON	Retraité/ Pdt d'association	France
22805	41	6	41	6	The term "social innovation" should be defined and illustrated. It is often used without any clear understanding of what it consists of. The title connects social innovation and behavioural change. Does it mean that a change in behaviour is a social innovation (a little reductive) or that the social innovation enables a change in behaviour (but it would then be necessary to specify which other innovations enable the change to be initiated, accompanied and supported).	By social innovation we refer to new social practises that may change behavior. We now mention this in the text.	Government of France	Ministère de la Transition éc	France
22807	41	6	41	6	Concerning the term behavioural changes", this section puts forward several explanations for individual behaviour, but does not mention the role of overarching contexts in access to resources that enable each individual to behave according to his or her choices. Here again, the capability approach would be very enlightening to connect behaviour (functioning), drivers, sustainable development and well-being.	Do to space constraints we do not go further into this, as we think we have been focusing on important determinants for behavior vhnage.	Government of France	Ministère de la Transition éc	France
86753	41	7	41	10	We suggest adjusting the language to that agreed upon under 2030 Agenda (SDG 12), replacing "climate friendly consumption" for "sustainable consumption".	Thank you this has been edited	Government of Argentina	Ministry of Environment and	Argentina
22809	41	8	41	8	Concerning the term "religion" we recommend to add gender and age if religion is to be treated. Also, items are put on the same level, whereas in some countries, religion is part of culture, identity values, etc. This list should be more scientifically sourced and more attention should be paid to the place of words.	Done. It could be seen that gender was part of identity, but it is also a social-structural form of difference that is known to be relevant to relevant forms of consumption, so worth specifying.	Government of France	Ministère de la Transition éc	France
22811	41	11	41	14	Consider revising this sentence for clarity. Perhaps the word 'your' is missing before the word 'values'.	Thank you	Government of France	Ministère de la Transition éc	France
22813	41	11	41	11	In a section on behaviour, more references in psychology, sociology, anthropology and neurosciences would be expected to be found, in order to take into account the complexity of behavioural factors and drivers. Mention of this disciplinary approach comes much later. The definition of identity on this line is furthermore restrictive.	More references from sociology and psychology introduced, and the economics references in the opening paragraph taken out. These references have drawn in part on the comments 2055-2071. The opening paragraph has been extensively revised to take account of this and those other comments.	Government of France	Ministère de la Transition éc	France
80915	41	11	41	14	Positional goods could be mentioned (see e.g. https://scholarworks.umass.edu/econ_workingpaper/132/)	This is true but not relevant perhaps to a section focused on social/psychological dynamics - positional goods is a key idea in relevant parts of economics of consumption going back to Hirsch 1976 (and beyond - to Hilferding in the 1910s!) but not to this literature focused on questions of culture and identity.	Heinz Wittenbrink	FH Joanneum University of A	Austria
70291	41	15		22	Also mention that in many poor countries, access to more animal-based proteins would improve food security and health outcomes	short statement reflecting this point incorporated	Philippe Tulkens	European Union (EU) - DG Re	Belgium
86755	41	15	41	17	As previously mentioned, scientific evidence supports the important contribution of certain meat production systems to carbon sequestration, so we suggest deleting this example as it is biased.	We respectfully disagree. While there are of course complexities, the references provided (many more could be) demonstrate that overall addressing meat production and consumption is important as a part of pursuing net zero emissions. It is not clear how the commenters see it as 'biased' - any specific sector generating GHG emissions will have its own particularities. across the chapter as a whole, various sectors are addressed.	Government of Argentina	Ministry of Environment and	Argentina
17283	41	17	41	18	See also: Plumwood, Val (2004) 'Ecofeminism,' in Robert White (ed.) <i>Controversies in Environmental Sociology</i> , Cambridge: Cambridge University Press, in which Plumwood critiques 'ontological veganism' advocating individual abstention from all animals as universalist and ethnocentric. This has been a topic in ecofeminist writing for decades and there is lots of knowledge and citations to draw on here.	This is a rather different point to the one made in the sentence - i.e. a normative/critical point about arguments for veganism, rather than an empirical point about the difficulty in shifting practices. But it is perhaps a point worth making (also it responds a little to concerns raised from a different angle in e.g. comment 86755) so has been added. Additional references also made regarding the difficulty of shifting practices in food consumption.	Joanna Flavell	University of Manchester	United Kingdom (of Great Britain and Northern Ireland)
86757	41	20			The reference to "green behaviour" is unclear and has not been discussed nor agreed in the appropriate multilateral fora. We suggest deleting the word "green", or replacing the words "green behaviour" by "sustainable consumption and production", in line with the 2030 Agenda and its SDGs, in particular SDG 12.	green' changed to 'sustainable' here.	Government of Argentina	Ministry of Environment and	Argentina
86759	41	20	41	22	As stated, the example on red meat is biased. We would appreciate its deletion.	This subclause has instead been deleted in line with comment 22817 (although not because the focus on red meat is 'biased').	Government of Argentina	Ministry of Environment and	Argentina
22815	41	21	41	22	this portion of the sentence has a strong illustrative power, and better be placed out of parentheses (which can be replaced by a coma). Also, given the general reluctance to implement additional taxes, it would be judicious to more explicitly illustrate the usage of taxing by changing the sentence to "as in the case of a tax on red meat that is used to fund subsidies of meat alternatives".	This subclause has instead been deleted in line with comment 22817.	Government of France	Ministère de la Transition éc	France
22817	41	21	41	21	Concerning "tax on red meat" it seems unsure that there are real life examples of countries instauring such a tax. An other more likely example is to instaurate a weekly vegetarian meal in school restaurants to educate children to meat-free meals (measure adopted in French law in 2018 - EGALIM law)	Agreed. there are no such taxes in place, although they are periodically proposed and there is a literature suggesting they could have effects on meat consumption. However they are also not a particularly good example of how the 'transition itself' would generate changes in behaviour. the infrastructure example regarding cycling in the following paragraph is a stronger example of this.	Government of France	Ministère de la Transition éc	France
2993	41	25	41	25	Should read 'biking lanes...'	thank you. changed to 'bicycle lanes' as a bit more formal.	Beth Edmondson	Federation University	Australia
2995	41	27	41	27	Reads as though education levels are increasing fairly evenly across the world. Needs brief details about patterns and why they matter.	Rejected. We do not think that this should be necessary.	Beth Edmondson	Federation University	Australia

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
48633	41	29			replace 'fertility' (which is a biophysical condition' with 'reproductive choices	The commenter is correct on this. The edit is slightly different to their proposal, now reading 'Further, a fall in poverty, and an improvement in health, and improvements in reproductive choice will also have implications for fertility, energy use and consumption globally.' The rationale is that they are correct that fertility is a biophysical measure, referring to the number of children each adult woman produces (on average), but so is energy use and consumption. The analytical point is surely that social improvements in reproductive choice are connected causally to changes (declines) in fertility and thus GHG emissions. There is an independent reason to be in favour of reproductive choice as well, but the point here is surely the causal logic to GHG emissions.	Lorraine Elliott	The Australian National University	Australia
80917	41	33	41	35	Why are media and communication studies not mentioned?	reference added to Boykoff	Heinz Wittenbrink	FH Joanneum University of Austria	Austria
78289	41	41	41	45	as well as sectors and systems, not rather than sectors.	sentence edited to delete reference to 'rather than sectors'	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
22819	41	42	41	43	Chapters 6-11 of this report are precisely sectoral chapters. It might be an overstatement to write that the report is using services rather than sectors to explore mitigation options.	sentence edited to delete reference to 'rather than sectors'	Government of France	Ministère de la Transition écologique	France
50571	41	42	41	42	"Using services, rather than sectors" - is this true? WGIII seems rather to be using services together with sectors. Both concepts seem to be used in the chapters, and section 1.5.1 is entitled "sectors and services".	sentence edited to delete reference to 'rather than sectors'	Anne Marie Treguier	CNRS	France
54565	41	42	41	43	Why isn't this point made much earlier? At least in Section 1.5.1?	'services and sectors' is the section title for section 1.4.1 at the start of the whole section. We think this is flagged significantly early on.	Government of United States of America	U.S. Department of State	United States of America
70293	41	42		45	This is an important statement that deserves greater attention and should be mentioned right at the beginning	'services and sectors' is the section title for section 1.4.1 at the start of the whole section. We think this is flagged significantly early on.	Phillippe Tulkens	European Union (EU) - DG Research	Belgium
4735	42	1	42	1	The climate lawsuits (Urgenda, Plan B, etc) in Europe and the US deserve mention here.	They are mentioned earlier	Julia Steinberger	University of Lausanne	Switzerland
66759	42	1	423	10	Please consider cross referencing Ch 13, which discusses three national governance challenges: coordination, mediating politics and strategy setting as key governance challenges requiring institutional solutions.	done	Navroz Dubash	Centre for Policy Research	India
14477	42	3	42	3	It seems odd to cite the IPCC SR1.5 report on the definition for institutions.	done	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
14479	42	4	42	4	"It became obvious..." what do you mean? Please rephrase.	noted	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
22821	42	4	42	5	Consider removing "It became obvious that" at the beginning of the sentence. Or clarify when and why this "became obvious".	done	Government of France	Ministère de la Transition écologique	France
48635	42	5			Either 'institutions are one factor in setting the economic incentives' or 'Among other roles, institutions also set the economic incentives'	done	Lorraine Elliott	The Australian National University	Australia
48637	42	8			A lot' is an unhelpful phrase	done	Lorraine Elliott	The Australian National University	Australia
48639	42	8			query 'nations' - do you mean countries, governments, states?	removed	Lorraine Elliott	The Australian National University	Australia
6123	42	13	42	15	One issue worth noting is that in some polities subnational unit policy plays an important role. In major emitters such as the United States and Canada, subnational units set policies that affect climate change in other subnational units and even cross international borders. I would encourage the authors to review the work of Hyunjung Ji and Sarah Liu on these issues.	We now cross refer to chapter 13 on national and sub national policies. Thank you	Matthew Krell	University of the West Indies	Barbados
22823	42	13	42	13	Consider replacing 'ambition' by 'ambitious'	done	Government of France	Ministère de la Transition écologique	France
27551	42	13	42	15	Delete "Several scholars have traced delay and sluggishness by states to pursue ambition climate mitigation policies to the activities of powerful interest groups who have vested interest in maintaining the current high carbon economic structures (Sullivan et al. 2018; Okereke and Russel 2010; Wilhite 2016)."	Deleted	Eleni Kaditi	Organization of the Petroleum Producers	Austria
77725	42	13	42	15	This should be more aligned with section 1.5.5 (on which see my four comments above). It also massively understates the role of industries/companies in obstructing climate action, and the number of scholars who have done important work to document this.	We briefly touch on these power relations and cross refer to 1.4.6 and chapter 13 for deeper discussions.	Fergus Green	Utrecht University	Netherlands
49793	42	16	42	23	This is an example of a key principle in Indigenous law from numerous regions. Planning for future generations is a core value. Tsileil-Waututh supports the concept that traditional and local Indigenous knowledge, law and governance systems are important and valuable sources for revisiting legal frameworks and policy.	noted	Chloe Hartley	Tsileil-Waututh Nation	Canada
20055	42	21	42	22	Recent literature body claiming that democratising climate politics is necessary for climate governance: - Nikas, A., Lieu, J., Sorman, A., Gambhir, A., Turhan, E., Baptista, B. V., & Doukas, H. (2020). The desirability of transitions in demand: Incorporating behavioural and societal transformations into energy modelling. Energy Research & Social Science, 70, 101780. - Galende-Sánchez, E., & Sorman, A. H. (2021). From consultation toward co-production in science and policy: A critical systematic review of participatory climate and energy initiatives. Energy Research & Social Science, 73, 101907. - Doukas, H., Nikas, A., Stamtsis, G., & Tsiouridis, I. (2020). The Green Versus Green Trap and a Way Forward. Energies, 13(20), 5473.	noted	Haris Doukas	National Technical University of Athens	Greece
20141	42	21	42	22	Noteworthy references on deliberative democracy and climate governance: - Stevenson, H., & Dryzek, J. S. (2014). Democratizing global climate governance. Cambridge University Press. - Nikas, A., Lieu, J., Sorman, A., Gambhir, A., Turhan, E., Baptista, B. V., & Doukas, H. (2020). The desirability of transitions in demand: Incorporating behavioural and societal transformations into energy modelling. Energy Research & Social Science, 70, 101780. - Sorman, A. H., Turhan, E., & Rosas Casals, M. (2020). Democratizing energy, energizing democracy: Central dimensions surfacing in the debate. Frontiers in Energy Research, 1-6. - Galende-Sánchez, E., & Sorman, A. H. (2021). From consultation toward co-production in science and policy: A critical systematic review of participatory climate and energy initiatives. Energy Research & Social Science, 73, 101907.	noted	Nikas Alexandros	National Technical University of Athens	Greece
12911	42	22	42	22	2019; Nico Stehr 2015). Only one name for a single author. Delete Nico	done	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan

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75781	42	24	42	30	Using the share of GHG emissions covered by NDCs or national targets might be misleading since those, in most cases, are not ambitious enough to meet 1.5-2 C (e.g. countries with low ambition or with respect to a baseline rather than absolute targets). Perhaps a more useful indicator could be the share of GHG under a net zero target (51% across 126 countries according to the latest UNEP report [8]) with the disadvantage that most of them are announcements and not legally binding. If the NDCs are left as reference, it would at least be useful to mention that some of the countries are not on track to meet their NDC goals (see [8]). [8] https://wedocs.unep.org/bitstream/handle/20.500.11822/34438/EGR20ESE.pdf?sequence=25	We no longer mention NDCs in this section	Herib Blanco	International Renewable Energy Agency	Germany
14481	42	27	42	30	Reference needed for these figures.	We have removed specific figures from this section due to the introductory nature of the chapter. We leave the detail to later in the report.	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
48167	42	27	42	30	The data here did not provide the source, it is recommended to supplement.	We have removed specific figures from this section due to the introductory nature of the chapter. We leave the detail to later in the report.	Yang Wang	Beijing Climate Center	China
66757	42	27	42	27	The citation Iacabuto and Hohne is incomplete. The full citation is Iacabuto, Dubash, Deribe and Hohne	This has been corrected.	Navroz Dubash	Centre for Policy Research	India
6125	42	31	42	35	Again the lack of attention to subnational units presents a concern. I would draw attention to the fact that under U.S. law, states are not bound by international law unless Congress enacts a statute that gives effect to American treaty obligations. The case of Medillin v. Texas is particularly instructive in this regard.	cross reference to ch. 13	Matthew Krell	University of the West Indies	Barbados
7949	42	31	42	35	This paragraph does not make much sense to me. It may even be self-contradictory. Saying that "enforcement is not a necessary condition for an instrument to be legally binding" suggests that legal binding does not need enforcement to be effective, which I think is a strong claim that needs more than one source to back it up. Saying that "compliance tends to be high once countries have ratified" treaties or agreements makes only sense in a world where treaties and agreements are from the onset on designed not to impose any meaningful restrictions on emission producing economic activities. Otherwise we would be much much more advanced globally with climate mitigation. We are not there precisely because the UNFCCC framework has not produced any treaty or agreement to date that would lead to necessary action to meet 1.5 or 2 deg climate future goals. So our lessons about compliance stem from a history of toothless treaties and agreements alone. Hence the last sentence suggests a dichotomy between compliance and ambition which is untenable in a counterfactual world where strong treaties and agreements prevail: there, ambition and non-compliance may correlate.	Noted	Jevgeniy Bluwstein	University of Fribourg	Switzerland
48641	42	31		32	amend to 'power to enforce compliance or sanction non-compliance'	done	Lorraine Elliott	The Australian National University	Australia
70295	42	31		47	This seems like a repetition of an earlier section	noted	Philippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
22825	42	32	42	37	it could also be added that the Paris Agreement has a strong transparency mechanism (article 13) which ensures that progress toward the achievement of NDCs are publicly communicated, therefore ensuring greater peer-pressure on Parties.	done	Government of France	Ministère de la Transition écologique	France
22827	42	33	42	35	We suggest to rephrase the statement : To promote positive action among decision makers, it would be worth finishing this paragraph with a statement in the form of "Nevertheless, it is a common conclusion that socio-environmental initiatives need a stronger prioritization on the national and international political scenes to avoid being repeatedly dwarfed by negative impacts of our globalized economy (Kayal et al. 2019)."	noted	Government of France	Ministère de la Transition écologique	France
5061	42	34	42	34	"In reality compliance tends to..." - this is a bold statement that should be backed with a reference/source	noted	Lina Hollender	n/a	Germany
48643	42	34			query 'compliance tends to be high' - what kind of compliance?	noted and edited	Lorraine Elliott	The Australian National University	Australia
5063	42	36	42	47	The entire paragraph makes a case for the bindingness of a ratified Treaty/Agreement. It says that the legal bindingness of Paris is "undeniable" - how does this match with the US having just re-entered the agreement? Apparently it was not that difficult after all to leave the Agreement.	noted	Lina Hollender	n/a	Germany
7951	42	36	43	10	this paragraph offers a narrow conceptualization of legality and legal bindingness, based in mainstream political science/international relations theory of norms in international relations which construct a legal framework. There are alternative and more critical ways to theorize International Relations which offer quite different analysis of the role of UNFCCC agreements and its "legality". Last paragraph on page 44 and first paragraph on 45 indirectly acknowledge that mainstream theory on UNFCCC based international cooperation has proven inadequate to explain and predict meaningful climate action. This should be reflected already in this section by drawing on alternative literatures	Cross reference to ch.14	Jevgeniy Bluwstein	University of Fribourg	Switzerland
51881	42	36			The section pushes for the legal binding of Paris Agreement which should be left for decision makers "Legally bindingness of the Paris Agreement is undeniable since it is justiciable based on the consent of States in its implementation as contracting states" . As commented above, the terms of reference should be UNFCCC not PA. In addition, this approach is based on only one reference source 'Bodansky'	noted, reference added.	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
85739	42	36	42	47	Suggest that the reference to national inventory should conclude "of greenhouse gas emissions and removals"	We have significantly restructured and this sentence no longer appears.	Government of Australia	Department of Industry, Science and Energy	Australia
22829	42	37	42	37	Suggestion to add after "these updated periodically" : "in a manner that represents a progression and Parties' highest possible ambition (article 4.3), therefore ensuring a way of ratchet up ambition overtime"	done	Government of France	Ministère de la Transition écologique	France
22831	42	37	42	37	In the sentence, "The Periodic update is seen as a way of ratchet up ambition overtime.", "is seen" seems to consider that it's a matter of perception. But it is written in the agreement itself (art 4.3) - cf previous comment). Suggestion to rephrase	done	Government of France	Ministère de la Transition écologique	France
14483	43	1	43	2	What is "ecological reflexivity"?	Removed	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
14485	43	4	43	4	What do you mean by "limit assurance to"?	Removed	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)

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48645	43	6			regime complex' more than just range of actors - see 'an array of partially overlapping and nonhierarchical institutions governing a particular issue-area . . . marked by the existence of several legal agreements that are created and maintained in distinct fora with participation of different sets of actors'; K. Raustiala and D.G. Victor, 'The Regime Complex for Plant Genetic Resources', 58:2 International Organization (2004), 277	Reference added thank you.	Lorraine Elliott	The Australian National University	Australia
45439	43	12	44	10	reference to chapter 16 should also be included in this text, and particularly to section 16.5 on policies.	Accepted	Elena Verdolini	University of Brescia and Eur	Italy
28493	43	17	43	18	I recommend adding electric mobility (covered in Chapter 10) to this list.	Mobility added	Pierpaolo Cazzola	International Transport Forum	France
12913	43	21	43	21	(SRES, p.24). Not clear this reference, delete page number, give year of publication of SRES	Clarified, but for a quote useful to give page num.	Amanullah Amanullah	Department of Agronomy, Thi	Pakistan
8225	43	24	43	30	As greenhouse gas emissions are almost universally underpriced - shouldn't the proposed idea of Carbon Tax be mentioned in this section?	Noted, but its covered in many places in the report and in policy attribution	Frida Zahlander	DanChurchAid	Denmark
84529	43	26	43	27	Please amend the text into "... but also due to various delay mechanisms (Karlsson and Gilek 2019) and multiple sources of path-dependence", and please add the following reference: "Karlsson, M., Gilek, M. (2019) Mind the gap. Coping with delay in environmental governance. Ambio 49, 1067–1075 (2020). https://doi.org/10.1007/s13280-019-01265-z "	Accepted	Mikael Karlsson	KTH Royal Institute of Techno	Sweden
12915	43	27	43	27	(Section 5.2 below). Delete below nothing found below	Accepted	Amanullah Amanullah	Department of Agronomy, Thi	Pakistan
45437	43	27	43	27	I do not understand the reference to "section 5.3 below".	This refers to section 1.7.4 in the new structure. Thanks for raising this.	Elena Verdolini	University of Brescia and Eur	Italy
50573	43	27	43	27	Have the concepts of path dependence and "lock in" been explained before? Probably these concepts need to be defined in this chapter?	In final draft, defined in sections 1.7 / 1.8.	Anne Marie Treuguier	CNRS	France
15467	43	30	43	30	"robust evidence, high agreement." This should be written in italic.	Thank you, this has been corrected	Hiroaki Kondo	National Institute of Advance	Japan
66761	43	40	43	40	A discussion of climate legislation should include references to Ch 13	Accepted	Navroz Dubash	Centre for Policy Research	India
12917	43	42	43	42	scale (chapter 16). Chapter not chapter also for Chapter 14 below	Accepted	Amanullah Amanullah	Department of Agronomy, Thi	Pakistan
70297	44	1	44	3	The chapter authors could consider citing the following article on EU energy efficiency policies: M. Economidou, V. Todeschi, P. Bertoldi, D. D'Agostino, P. Zangheri, L. Castellazzi, Review of 50 years of EU energy efficiency policies for buildings, Energy and Buildings, Volume 225, 2020, ISSN 0378-7788, https://doi.org/10.1016/j.enbuild.2020.110322 , https://www.sciencedirect.com/science/article/pii/S0378778820317229	Accepted	Phillippe Tulkens	European Union (EU) - DG Re	Belgium
72311	44	1	44	3	The chapter authors could consider citing the following article on EU energy efficiency policies: Economidou, V. Todeschi, P. Bertoldi, D. D'Agostino, P. Zangheri, L. Castellazzi, Review of 50 years of EU energy efficiency policies for buildings, Energy and Buildings, Volume 225, 2020, https://doi.org/10.1016/j.enbuild.2020.110322 , https://www.sciencedirect.com/science/article/pii/S0378778820317229 .	Accepted	bertoldi paolo	european commission	Italy
10515	44	4	44	6	Careless english here	Thank you for raising this, edited the wording.	Phillippe Waldteufel	CNRS	France
51955	44	4	44	6	Not clear sentence.	Thank you for raising this, edited the wording.	Government of Saudi Arabia	Sustainability Advisor to the	Saudi Arabia
28495	44	8	45	25	I think there is scope to mention here the fact that international cooperation can be an instrument allowing to achieve greater scale, and therefore spur cost reductions due to learning and scale effects, for low-carbon technologies. This message is currently not included at all here.	This now addressed in the following section	Pierpaolo Cazzola	International Transport Forum	France
45441	44	8	45	25	Chapter 16 addresses also the issue of international cooperation for technology development and diffusion, an aspect which should be mentioned here as well.	deleted	Elena Verdolini	University of Brescia and Eur	Italy
14487	44	9	44	11	This paragraph is redundant. I would delete.	Thanks, done	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
11109	44	12	44	23	In Chapter 14 we describe these issues, while also embedding them in a discussion of framing that is relevant for international cooperation. We need to coordinate.	agree. Refer to ch.14	Anthony Patt	ETH Zürich	Switzerland
14489	44	12	44	13	Should read "climate action", and what is the "Bodansky and Lavanya, 2017" reference? :)	revised	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
77727	44	12	44	23	The longstanding framing of international climate cooperation being "essential" due to its game-theoretic structure needs to be revisited in light of work on domestic climate politics, the co-benefits of unilateral action, and the low costs of much decarbonisation. The recent special issue in GEP, especially the papers by Hale and Aklin & Mildenerberger, and the earlier working paper by Green on "Nationally Self-Interested Climate Mitigation" (2015) deserve mention here.	noted	Fergus Green	Utrecht University	Netherlands
48647	44	17			cite evidence for claim that there is a tendency among govts to think that mitigation efforts will raise energy costs ...	Many measures do raise costs at least in short term	Lorraine Elliott	The Australian National Univ	Australia
2997	44	24	44	24	Should read 'roles of international institutions set up...'	done	Beth Edmondson	Federation University	Australia
11111	44	24	45	13	You make several points here that we do not describe in Chapter 14. I actually like your text here, and think that some of the points you raise ought to be in 14, but then we need to coordinate the redrafting.	agree.	Anthony Patt	ETH Zürich	Switzerland
85741	44	24	44	37	Suggest redraft to note that these principles have been developed, but to avoid making claims about their effect. It is not correct to suggest that the principles mentioned - including CBDR-RC - have been "vital to maintain cooperation among states" - their effect has been variable and politically contentious. As such, the formulation of these principles have evolved over time.	Done. The word "vital" has been removed.	Government of Australia	Department of Industry, Scie	Australia
83015	44	38	44	39	You may want to consider adding literature on "organized hypocrisy" specifically in international climate policy, in a narrower sense (based on Brunnson's hypocrisy/inconsistency concept) like Geden 2016 (https://onlinelibrary.wiley.com/doi/abs/10.1002/wcc.427) and/or in a broader sense, like Dubash 2020 (https://onlinelibrary.wiley.com/doi/10.1002/wcc.622)	Addressed	Geden Oliver	German Institute for Internat	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
14491	44	39	44	42	It is over 30 years, not 20 years! The climate negotiations began in 1990. Statements such as "some have argued" require a reference. Two ideal references here would be: (1) Richard Kinley, Michael Zammit Cutajar, Yvo de Boer & Christiana Figueres (2020) Beyond good intentions, to urgent action: Former UNFCCC leaders take stock of thirty years of international climate change negotiations, Climate Policy, DOI: 10.1080/14693062.2020.1860567 and (2) Stoddard J, Anderson K, Capstick S, Carton W, Depledge J, Facer K, Gough C, Hache F, Hoolohan C, Hultman M, Hällström N, Kartha S, Klinsky S, Kuchler M, Lövbrand E, Nasiritousi N, Newell P, Peters GP, Sokona Y, Stirling A, Stilwell M, Spash C, Williams M (2021) Three decades of climate mitigation: why haven't we bent the global emissions curve? Annual Review of Environment and Resources, Volume 46. In press. doi: 10.1146/annurev-environ-012220-011104	sentence edited to delete reference to 'rather than sectors'	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
45753	45	8	45	9	Please include the Global Stocktake as one of the most important top-down centralised elements of the Paris Agreement.	Global stocktake is discussed in 1.3.1. and more on Chapter 14 on Paris Agreement	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
20143	45	14	45	25	Along with CCPI and other indices, perhaps add the SDGI, ETI (Singh, H. V., Bocca, R., Gomez, P., Dahlke, S., & Bazilian, M. (2019). The energy transitions index: An analytic framework for understanding the evolving global energy system. Energy Strategy Reviews, 26, 100382.) and SETRI (Neofytou, H., Nikas, A., & Doukas, H. (2020). Sustainable energy transition readiness: A multicriteria assessment index. Renewable and Sustainable Energy Reviews, 131, 109988.)	Energy Transition Index has been added.	Nikas Alexandros	National Technical University of Athens	Greece
14493	45	22	45	22	"in stives" - meaning what?	edited	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
15469	45	22	45	22	"in stives": What is this word?	edited	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan
61235	45	22	45	22	"in stives" appears to be a typo	edited	Janne M. Korhonen	Lappeenranta University of Technology	Finland
19081	45	27	45	27	In future (AR??), frame and pursue the challenge as nonlinear control.	Nice idea!	Fred Amony	Lyclar	United Kingdom (of Great Britain and Northern Ireland)
70299	45	27			This section would fit much better in the beginning	Debated but rejected for a policy audience	Philippe Tulkens	European Union (EU) - DG Research and Innovation	Belgium
77729	45	27	49	9	The reliance of economic approaches on (controversial) normative assumptions should be made more explicit and central, otherwise the organisation of the section risks conveying the misperception that "economics" and "ethics" are separate, and that economics is an objective science that provides neutral answers to social problems. Though mentioned briefly on page 47 (lines 23-24), the ethical assumptions of welfare economics that underlie the whole of section 1.6.2 should be acknowledged up front, in section 1.6.1 and a new chapter of 1.6.2. The work of the foundational concepts and principles chapter (led by Broome) in WGIII's 5AR could usefully be incorporated here. Additionally, numerous references in section 1.6.2 to what "economics" acknowledges/finds/sees (aside from falsely anthropomorphising an academic discipline and reinforcing its hegemonic status) falsely reduces the field of economics to one—controversial though mainstream—theoretical approach, namely neoclassical welfare economics.	This has been covered in previous IPCC Assessments (see eg. AR5 Mitigation report .. Indeed dating back to AR2 with discussion of the impossibility theorem on consistent aggregation), and it is core task of AR6 to discuss newer developments and literature. However we have been at pains in this chapter to discuss other frameworks, as well as introduce a wider set of economic approaches. It is not really the job of IPCC to engage in semantic discussion of what should be called economics however.	Fergus Green	Utrecht University	Netherlands
50575	45	37	46	10	The links from the "four ways" of AR5 to the "three types of effects" and then to the four frameworks are somewhat difficult to follow. Is there a simpler way to introduce the four frameworks, their novelty relative to AR5, and their use in the WGIII chapters?	The "Three types of effects" were from SR1.5, but agree not material and with hindsight confusing, have removed these	Anne Marie Treguier	CNRS	France
15719	46	12	49	9	The sections discuss uncertainty, but only uncertainty related to the benefits of mitigation. It ignores the role of technological and hence cost uncertainty which is also important for the design of policies and policy instruments. There is a large literature in this field.	Actually in this section in a sub-section (new number 1.7.1.2) there is a discussion of dynamic efficiency and uncertainty which addresses this comment. The central reference in this sub-section (Gillingham and Stock 2018) explicitly talk about costs of abatement.	Katarina Elofsson	Aarhus University	Denmark
17457	46	12	49	9	Dynamic efficiency does not appear to be a third approach that would be different from cost-benefit and cost-effectiveness. Rather, the question of the timing of action, of inertia, lock-in etc, and the way to account for time is an important aspect of both cost-benefit and cost-effectiveness approaches. I would suggest to rephrase the title and organize the sections accordingly	Yes, time (the dynamic dimension) is an integral part of cost-benefit (CB) and cost-effectiveness (CE). It is not a third approach. In this section (now numbered 1.7.1) the first two sub-sections -- 1.7.1.1 on CB and CE and 1.7.1.2 on dynamic efficiency are to be read in a continuum where 1.7.1.2 is an elaboration of the previous one.	Celine Guivarch	CIRED	France
17459	46	12	49	9	An emphasis in this section on welfare and well-being, rather than/in addition to on costs and monetization, would be useful.	This section (1.7.1) discusses one of the four analytic frameworks, namely, aggregated approaches. Welfare and well being are implicit in them.	Celine Guivarch	CIRED	France
51957	46	12	48	21	Better transitions are needed to improve the flow (remove sub-sections)	Accepted, thanks	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
53441	46	12	49	9	You start this section by stating that "Economic perspectives have coalesced around two main approaches..."; again, this is a really narrow view focussing on a mainstream economics perspective only, thereby neglecting the multitude of pluralistic economic schools of thought - all of which have crucial insights, ideas and pathways for action to offer on climate change (feminist, institutional, Post Keynesian, Marxian, evolutionary, complexity, ecological economics etc.) - you choose the narrative, ideas and policy instruments of one school of thought - the one school of thought that is strongest aligned with the status quo, rather than critically questioning it, and offering real structural and systemic alternatives. This is extremely worrying for the credibility of the entire IPCC project and community!	This sub-section (1.7.1) should not be viewed in isolation. It is one of 4 ways of thinking about the problem. The other three are not economic in nature. All that is being said here is that an aggregated economic framework (cost-benefit or cost-effectiveness) is one of the analytical frameworks. We have however added a short subsection here (1.7.1.3) Disequilibrium, complex systems and evolutionary approaches	Elke Pirgmaier	University of Lausanne	Switzerland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
80193	46	12	49	9	<p>Interventions such as SRM could be undertaken by smaller numbers of actors. This possibility is frequently treated as undesirable, or a threat to social justice and equity. However the relative risk and potential benefits of SRM versus warming should be considered in the context of market failures and potential insurance models (loss and damage mechanisms) to reduce risk. The interests of more vulnerable countries in insuring against collective failure to reduce severe risks to their communities may warrant consideration of SRM techniques as a means of promoting equity and thorough exploration of their potential to promote safety as a question of social justice.</p> <p>For a discussion of sub-collective action frameworks:</p> <ul style="list-style-type: none"> • Engel, K.H. and Saleska, S.R., 2005. Subglobal regulation of the global commons: The case of climate change. <i>Ecology</i> 10, 32, p.183. https://www.jstor.org/stable/24114448?seq=1 • G. Heutel, J. Moreno-Cruz, S. Shayegh <i>Journal of Environmental Economics and Management</i> 87 (2018) 24–41, <i>Solar geoengineering, uncertainty, and the price of carbon</i> https://www.nber.org/papers/w21355.pdf • Yosuke Arino, Keigo Akimoto, Fuminori Sano, Takashi Homma, Junichiro Oda, and Toshimasa Tomoda <i>PNAS</i> May 24, 2016. 113 (21) 5886-5891; https://doi.org/10.1073/pnas.1520795113 	<p>Thanks for sharing the references, will try to incorporate them somewhere else in the chapter. Re SRM we do not believe it fits in this section which is about _analytical frameworks_</p>	Kelly Wanser	SilverLining	United States of America
20363	46	13	46	25	<p>The subheading is "Evaluating global pathways under uncertainty", but there is little on uncertainty. In fact, the next reference to uncertainty is on the next page. The analyses of Nordhaus, for example, are fully of deterministic nature. Cost-benefit analyses that do take uncertainties into account include for example Crost and Traeger 2014 (DOI: 10.1038/NCLIMATE2249) and Ekholm 2018 (https://doi.org/10.1016/j.ecolecon.2018.07.024). Something along these lines should be added to the text.</p>	<p>This section (1.7) has been redrafted. The subheading is no longer there.</p>	Tommi Ekholm	Finnish Meteorological Institute	Finland
54567	46	13	46	13	<p>This subsection does not include a discussion of evaluation under uncertainty.</p>	<p>This overall section (1.7) is about four different analytical frameworks. Uncertainty and risk can be part of any/all of these.</p>	Government of United States of America	U.S. Department of State	United States of America
12783	46	14	46	16	<p>The report does not sufficiently take into account the economic and social scientific research criticizing current economic theories. It says economic approaches have coalesced only around two approaches dealing with cost-benefits and cost-effective mitigation. These are very narrow ways of talking about the large questions economic theories are facing in relation to dealing with societal challenges such as climate change. Difficult trade-offs and the need for uncomfortable decisions must be acknowledged throughout and not hidden in talk of cost effectiveness that allude that these issues can and will be dealt with through simple calculations. One of the main issues we are facing is the need to question some of the economic frameworks we are relying on, which have created policies that encourage an economy spinning out of control in attempts to chase GDP growth at all costs, and do not take environmental damage and planetary boundaries sufficiently into account. A recent interdisciplinary review of literature (Stoddard et al 2021) reveals how the role of power, vested interests and narrow techno-economic mindsets, along with neglect of equity dimensions, have posed key impediments to bending the emissions curve. We cannot keep relying on the same literature, theories and policies that have caused the present situation and not managed to get us out if it for several decades. Current economic policies are still based on simplistic assumptions of how markets will solve key issues, rather than politics setting tighter boundaries for the economy in the first place. The critical perspective gets too little attention in the report in general, even though it is a legitimate scientific perspective shared by an increasing number of economists, as well as a large number of social scientists. See refs and links.</p> <p>References: Limits to growth (1972), Prosperity without growth (2009) Kallis, G. (2020). <i>Limits. In Limits</i>. Stanford University Press. Stoddard I, Anderson K, Capstick S, Carton W, Depledge J, Facer K, Gough C, Hache F, Hoolohan C, Hultman M, Hällström N, Kartha S, Klinsky S, Kuchler M, Lövbrand E, Nasiritoui N, Newell P, Peters GP, Sokona Y, Stirling A, Stilwell M, Spash C, Williams M (2021) Three decades of climate mitigation: why haven't we bent the global emissions curve? <i>Annual Review of Environment and Resources</i>, Volume 46. In press. doi: 10.1146/annurev-environ-012220-011104 More about alternatives to current economic theories: https://steadystate.org/discover/myths-and-reality/</p>	<p>This sub-section (1.7.1) should not be viewed in isolation. It is one of 4 ways of thinking about the problem. The other three are not economic in nature. All that is being said here is that an aggregated economic framework (cost-benefit or cost-effectiveness) is one of the analytical frameworks. Also, section 1.7 has been extended to indicate briefly a wider range of econ frameworks (1.7.1.3). We have however added a short subsection here (1.7.1.3)Disequilibrium, complex systems and evolutionary approaches)</p>	Flora Hajdu	Swedish University of Agricultural Sciences	Sweden
20359	46	14	46	16	<p>The text cites Nordhaus for the cost-benefit approach, but the text should also have references for the cost-effectiveness approaches. One example is here: Ekholm, T. 2014: Hedging the climate sensitivity risks of a temperature target, <i>Climatic Change</i> 127 (2), pp. 153-167. This paper looks at remaining below 2C temperature increase from pre-industrial period cost-efficiently, while also considering the effect of uncertain climate sensitivity towards the temperature limit.</p>	<p>Thanks for the reference. Will include it.</p>	Tommi Ekholm	Finnish Meteorological Institute	Finland
14495	46	17	46	17	<p>This is the fourth mention of the UNFCCC objective in this chapter (plus another mention in the executive summary, and another in a footnote). In most cases, including this one, the reference is imprecise. The goal is "prevent dangerous anthropogenic interference". It probably means the same thing as "avoiding", but if there is a direct quotation, it must be correct.</p>	<p>The text from UNFCCC Article 2 is correctly cited.</p>	Joanna Depledge	Centre for Environment, Energy and Natural Resource Governance (CEENRG), University of Cambridge	United Kingdom (of Great Britain and Northern Ireland)
85743	46	18	46	18	<p>Suggest should read "avoiding dangerous anthropogenic interference with the climate system".</p>	<p>This is as per UNFCCC Article 2 "... that would prevent dangerous anthropogenic interference with the climate system."</p>	Government of Australia	Department of Industry, Science and Resources	Australia
20437	46	19	46	23	<p>Relating to the results from cost-benefit models, there has been notable critique for these methods that should be mentioned here. One tightly articulated example is from Robert Pindyck, 2013 (http://dx.doi.org/10.1257/jel.51.3.860)and 2017 (https://doi.org/10.1093/reep/rew012).</p>	<p>Cited, thanks</p>	Tommi Ekholm	Finnish Meteorological Institute	Finland
20439	46	23	46	25	<p>This statement about reconciling these two approaches definitely requires at least a few citations to papers that do so. A short sentence about how this is done exactly would also be helpful for the reader.</p>	<p>The main content is covered in the Box in Chapter 3 that is cited. In our Intro chapter we didn't have space to give further details</p>	Tommi Ekholm	Finnish Meteorological Institute	Finland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
72403	46	25	46	25	I would encourage adding a version of Steve Keen's critique, not least because systematically addressing the methodological questions raised here and elsewhere will strengthen the WG3 analysis: "Fundamental critiques of Nordhaus and the data used to calibrate IAMs raise the question whether neoclassical economics can reliably inform climate economic models and policy. Economists made their own predictions of damages, using three spurious methods: Assuming that about 90% of GDP will be unaffected by climate change, because it happens indoors; using the relationship between temperature and GDP today as a proxy for the impact of global warming over time; and using surveys that diluted extreme warnings from scientists with optimistic expectations from economists. Nordhaus in particular misrepresented parts of the scientific literature to justify using a smooth function to describe the damage to GDP from climate change. Correcting for these errors makes it feasible that the economic damages from climate change are at least an order of magnitude worse than forecast by economists, and may be so great as to threaten the survival of human civilization (Keen 2020)."	Is now cited	Paul Maidowski	Fletcher School, Tufts; indepe	Germany
72405	46	25	46	25	Add reference: Keen, Steve. 2020. "The Appallingly Bad Neoclassical Economics of Climate Change." Globalizations: 1–29. doi: 10.1080/14747731.2020.1807856.	Is now cited	Paul Maidowski	Fletcher School, Tufts; indepe	Germany
17461	46	26	46	35	for this small section on damages and risks, the following paper, analysing when risk plays a role, may be useful: Taconet, Nicolas, Céline Guivarch, and Antonin Pottier. 2021. "Social Cost of Carbon Under Stochastic Tipping Points." Environmental and Resource Economics, March. https://doi.org/10.1007/s10640-021-00549-x.	Thanks, Cited	Celine Guivarch	CIRED	France
61237	46	26	46	35	Consider adding reference to the work of Daniel et al (PNAS, 2019), who provided a novel way of assessing CO2 prices by using insights from asset pricing models. Their model assesses unknown damages in the distant future based on probabilistic assumptions around climate damages, and in contrast to models reviewed here, suggests a high price today that is expected to decline in time. This article raises a very good question about whether even our basic assumptions concerning the CO2 pricing and SCC are correct, and illustrates a different approach. Reference: Daniel, Kent D.; Litterman, Robert B.; Wagner, Gernot (2019). Declining CO2 price paths. PNAS 116(42), 20886-20891.https://doi.org/10.1073/pnas.1817444116	Thanks, Cited	Janne M. Korhonen	Lappeenranta University of T	Finland
20361	46	31	46	32	This sentence ("One review considered...") doesn't sit well here, under the heading "Damages and risks". Could perhaps fit section 1.6.2.3 better.	This has been moved in the course of our restructuring, thank you	Tommi Ekholm	Finnish Meteorological Instit	Finland
48649	46	31		35	paragraph sits oddly here	This has been moved in the course of our restructuring, thank you	Lorraine Elliott	The Australian National Univ	Australia
75935	46	36	46	45	I think it would be useful for readers that are not familiar with discounting if you could mention that discounting are related to how we value benefits and damages over time; i.e. that this is not a purely natural and scientific concept. Obvious to economists, but I think this is useful to know for many readers	We hope text is clear enough, there is very limited space and discounting has been covered in every previous report.	Jan Fuglested	CICERO	Norway
3971	46	39	46	43	It is great that there is more explicit discussion of recent advances on discounting in this draft! Here is a short comment relating to one of the claims. I do not think the sentence "Economic literature suggests applying risk free, public, and long-term interest rates when evaluating climate change" is correct. The risk-free, public, and long-term discount rates is a critical input here, but one additionally needs to account for project-specific risk. In relation to climate change, see, e.g., Dietz et al. (2018), Daniel et al. (2016) and Sandsmark and Vennemo (2007), all discussed in Section IV.C. "Discounting Expected Cash Flows" in Drupp et al. (2018). Section IV.C. in Drupp et al. (2018) also includes a brief discussion of how the risk-free rate is a critical input to these adjusted discount rates. Essentially, all projects require information on the risk-free discount rate even in the expected cash flow setting. While Drupp et al. (2018) finds that this rate is lower than in many of the studies reviewed in earlier IPCC Assessments, estimating the risk premiums associated with long-term projects is a tricky issue about which there is little general agreement. A refined version of the text reads: "Economic literature has considered risk-free, public, and long-term discount rates when evaluating climate change (Weitzman 2001; Dasgupta 2008; Arrow et al. 2013; Groom and Hepburn 2017). Expert elicitations indicate risk-free values of around 2-3% (Drupp et al. 2018), lower than in many of the studies reviewed in earlier IPCC Assessments, hence increasing the weight accorded to the future. While all projects require information on the risk-free discount rate, any given project should be penalized (rewarded) using a specific risk adjustment depending on whether it increases (reduces) macroeconomic risk. Estimating the risk premiums associated with long-term projects is a tricky issue about which there is little general agreement (see, e.g., Dietz et al. 2018; Daniel et al. 2016; Sandsmark and Vennemo 2007 in relation to climate change)."	Text around Drupp ref Amended in shortened form	Frikk Nesje	Department of Economics, U	Denmark
78291	46	40	46	45	As the actual discount rates used in many IAMs are 5%, this needs a little explanation.	Clarified	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
54569	46	41	46	42	"Expert elicitations indicate values around 2-3% (Drupp et al. 2018)". Drupp et al. (2018) surveyed over 200 experts and found "surprising degree of consensus among experts, with more than three-quarters finding the median risk-free social discount rate of 2 percent acceptable." Suggest editing this sentence to read, "Expert elicitations indicate values around 2% (Drupp et al., 2018)."	Sentiment included more briefly.	Government of United States of America	U.S. Department of State	United States of America
17463	47	1	47	10	it is very unclear for me what is meant by "hybrid cost-benefit approaches" and I wonder whether this term is an unnecessary complication of the message. Also I do not see how the second paragraph relates to something "hybrid", and seems to refer to cost-benefit approaches. The use of "optimal" without defining along which lines optimality is defined makes the message very technical and not easy to understand.	Hybrid approaches simply refer to papers that have elements of both - cost-benefit and cost-effectiveness approaches. Optimal is in the sense of maximising aggregate welfare. It has been contextualised earlier in the discussion. We think this is clear enough but have further redrafted this portion.	Celine Guivarch	CIRED	France
50621	47	9	47	10	Which box is referred to here? I could not find it in chapter 3.	Clarified	Anne Marie Treguier	CNRS	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
2999	47	11	47	13	Not entirely clear what this really means, or why it is presented here.	Inefficient implementation refers to mitigation - differences in policy stringency across countries could lead to carbon leakage and make mitigation less effective.	Beth Edmondson	Federation University	Australia
15471	47	11	47	11	"Inefficient implementation": This should be written in italic.	Thank you, corrected this	Hiroaki Kondo	National Institute of Advanced Industrial Science and Technology	Japan
17465	47	11	47	17	The issue of co-benefits (and adverse side effects) deserves more emphasis, and is misplaced in a title "inefficient implementation". It would be useful to refer to parts in the report where co-benefits are treated, for instance in chapter 3, section 3.6.3, but also in other chapters.	Inefficient implementation is no longer in the title. In our view the treatment of co-benefits is adequate - they are elaborated in Table 1-2 and a key reference is also cited.	Celine Guivarch	CIREC	France
84531	47	13	47	14	Please add the following after "...the conclusion.": "However, a review of co-benefit studies shows that many co-benefits are overlooked and that results from existing studies are seldom considered in cost-benefit assessments and climate policy decision-making (Karlsson et al. 2020)."	Rejected - this study gets a lot of coverage in our chapter and space is very limited	Mikael Karlsson	KTH Royal Institute of Technology	Sweden
50577	47	14	47	17	how does this relate to the paragraph on "discounting" above?	Previous para slightly modified in ways that hopefully help clarify	Anne Marie Treguier	CNRS	France
17467	47	18	47	35	The distributive issue goes beyond the question of the distribution of impacts of climate change, it should include the distributive effects of climate change mitigation policies as well, and refer to places in the whole report where this is addressed, for instance in chapitre 3 section 3.6.4, but also, and mainly, in chapters 5 and 13.	Amended to include	Celine Guivarch	CIREC	France
12919	47	24	47	24	(next section) delete it	No reason given, but Text has been edited.	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
17469	47	26	48	2	There seem to be too much space devoted to the tools underlying the approaches in the section. I would suggest to keep it short here to allow more development on substantive elements, and refer to places where IAMs are described in detail (Annex C in particular).	We move abbreviated IAM discussion to section 5 in FGD, and included here a direct ref to Annex C	Celine Guivarch	CIREC	France
20057	47	26	47	33	For a comprehensive classification scheme, also adopted by the NGFS and IMF reports: Nikas, A., Doukas, H., & Papandreou, A. (2019). A detailed overview and consistent classification of climate-economy models. Understanding risks and uncertainties in energy and climate policy, 1-54.	Added, in IAM paras moved to section 5.	Haris Doukas	National Technical University of Athens	Greece
45443	47	26	48	2	Chapter 16 includes a box on the modelling of technological change in IAMs and other models, including the issue of technology cost uncertainty. This seems relevant here, and perhaps a mention/reference should be provided (or, if not here, in the following section 1.6.2.2)	Read the box, thanks, included cross-ref in the (moved) IAM section	Elena Verdolini	University of Brescia and European Commission	Italy
45705	47	26	48	2	The ability of the IAMs to provide reliable information about future mitigation pathways has been criticized in recent years, in particular the lack of transparency of the assumptions and simplifications and their consequences for the simulated pathways. To this end we highly appreciate the detailed explanation in Annex C. However, the main text also needs to be contain the main information since most users might not read Annexes. For example, please mention that most IAMs do not consider climate change impacts nor positive/negative side effects of mitigation action in a less subtle way than in the current text. Please comment on the possibility of IAMs assuming outdated potentials and costs of renewable energy options. See also our comments on Annex C and on the Entire Report.	IAMs are now outlined in the Scenarios section 5 which notes in a very compact way some of these limitations	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
50579	47	26	47	26	This seems like the first definition of IAMs in this chapter, but IAMs have been mentioned before (p46 39). Is the information on IAMs presented in the best way in this chapter?	IAMs are now outlined in the Scenarios section 5	Anne Marie Treguier	CNRS	France
20367	47	30	47	32	A sensitivity analysis on the effect of discount rate choice, future mitigation costs and uncertainty assumptions for climate sensitivity and damages resulted in an even more broader range for the social cost of carbon: from 18 to 340 USD/t CO2 in 2030. Please see Ekholm, T. 2018. : Optimal mitigation strategy under uncertainty and learning on climate sensitivity and damages, Ecological Economics 154, pp. 99-106. (https://doi.org/10.1016/j.ecolecon.2018.07.024)	Thanks - incorporated	Tommi Ekholm	Finnish Meteorological Institute	Finland
4869	47	31	47	33	"IAMs and other whole-system models mostly assume optimization, which makes it hard to represent cost-effective efficiency options..." Not quite sure what is meant here. If efficiency options are cost-effective, deploying them will maximize welfare; if the models accurately depict welfare maximization, they will include cost-effective efficiency options. Perhaps what "makes it hard to represent cost-effective" options is rather the granularity of efficiency options – it is more an aggregation problem. Whole-system models implicitly assume cost-effectiveness at the aggregate level – that only those options that are cost-effective are deployed. This efficiency mechanism is buried in assumed parameters for productivity gains so is again quite aggregated.	The limitations of IAMs have been incorporated in the revised text.	Harry Saunders	Carnegie Institution for Science	United States of America
4871	47	32	47	33	Citation should read "(Saunders et al 2021)" as shown in the References.	Thank you for pointing this out. corrected this.	Harry Saunders	Carnegie Institution for Science	United States of America
4873	47	33	47	33	To "...reflect associated 'rebound' at system level", suggest adding, "and estimated rebounds appear to rise with greater levels of aggregation."	Space too squeezed	Harry Saunders	Carnegie Institution for Science	United States of America
20365	47	43	47	44	Odd wording, please clarify: "Very long-run cost-benefit carries the challenges noted."	amended	Tommi Ekholm	Finnish Meteorological Institute	Finland
17471	48	3	48	21	It would be necessary to link this section with section 3.5 on interaction between near-, medium- and long-term action in mitigation pathways.	Good point, done	Celine Guivarch	CIREC	France
50585	48	10	48	15	This paragraph is focussed on IAMs. I suppose that IAMs are an important tool for WGIII? If so, perhaps 1.6.2 would be clearer by having a specific subsection on IAMs, including dynamic efficiency, rather than introducing IAMs together with many other concepts in 1.6.2.1.	We have a very short section on IAMs now in section 1.5, but the main discussion is in Annex C to which we now refer	Anne Marie Treguier	CNRS	France
12921	48	15	48	15	Grubb et al. (2020) remove extra bracket	Thank you	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
12923	48	18	48	18	(Grubb et al. 2020, Baldwin et al. 2020). Always use ; to separate different citation inside brackets	Thanks, done	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
7813	48	22	48	35	The argument here confused the difference between Pigouvian Tax (pursuing to set carbon tax to the same level as social cost of carbon) and Baumol-Autes tax (pursuing to achieve the set targets at the least cost). For example USD40-80/tCO2 is not pursuing to set tax at the level equal to social cost of carbon. I have no objection to argue tax is the most cost effective measure to achieve desired emissions reductions, but wish the difference between Pigouvian Tax and Baumol-Autes tax to be clearer.	clarified.	Mitsunone Yamaguchi	Research Institute for the Environment and Livelihoods	Japan
11113	48	22	49	9	I really like your overview of economic instruments, and think that what is written in chapter 13 needs to be harmonized with it. In particular, you have managed to bring in issues of political feasibility that Chapter 13 fails to cover.	Noted, thanks	Anthony Patt	ETH Zürich	Switzerland
17473	48	22	49	9	A discussion on economic instruments does not seem to fit in a section on cost benefit and cost efficiency approaches. It is treated in large in chapter 13.	They are so central debate we felt Ch.1 should mention core issues briefly, but concluded it worked better illustrating the need for multi-dimensional assessment (now in section 1.8)	Celine Guivarch	CIREC	France
79887	48	22	48	43	Suggest to include observations of the importance of Market Mechanisms and the risk of further delaying in terms of projected emissions reductions of the implementation of Collaborative Approaches under Art. 6 of the Paris Agreement.	A reference would have helped, but these issues are mainly addressed in Chapters 3, 13 and 14.	Carlos Ruiz Garvia	UNFCCC	Panama

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
27553	48	25	48	26	Analysis should refer to inefficient fossil fuel subsidies that encourage wasteful consumption, in order to consider matters related to sustainable development.	Mentioned in section 1.4.8 FGD	Eleni Kaditi	Organization of the Petroleum	Austria
27555	48	27	48	35	Analysis should refer to the use of carbon pricing considering national circumstances and priorities, and taking into account adverse impacts of such mitigation approaches and distributional effects.	Incorporated in carbon pricing discussion, now in section 1.8.2 FGD	Eleni Kaditi	Organization of the Petroleum	Austria
14497	48	33	48	35	This would be a good reference: Jeroen C. J. M. van den Bergh, Arild Angelsen, Andrea Baranzini, W. J. W. Botzen, Stefano Carattini, Stefan Drews, Tessa Dunlop, Eric Gallbraith, Elisabeth Gottbauer, Richard B. Howarth, Emilio Padilla, Jordi Roca & Robert C. Schmidt (2020) A dual-track transition to global carbon pricing. <i>Climate Policy</i> , 20:9, 1057-1069. DOI: 10.1080/14693062.2020.1797618	Added in 1.8	Joanna Depledge	Centre for Environment, Energy	United Kingdom (of Great Britain and Northern Ireland)
77731	48	39	48	40	"which may be addressed by combining redistribution of revenues with support for low carbon innovation". This is true but reflects an excessively narrow vision of the possibilities for tackling distributional effects and underlying inequalities alongside climate action: much wider redistributive and predistributive reforms - not to mention more systemic reconfigurations of power structures - would also serve to redress possible regressive impacts of carbon pricing whilst also tackling pre-existing inequalities, injustices and poverty. See, e.g., the growing literature on the Green New Deal. E.g. Aronoff et al., "A Planet to Win" (2020); Galvin & Healy (2020).	Not convinced that Chapter 1 is the place to get into Green New Deal economics, beyond the brief underlying theory refs in new subsection 1.7.3	Fergus Green	Utrecht University	Netherlands
77733	48	42	49	2	This overstates the extent of carbon pricing (and extent to which it can be feasibly priced) to date by not mentioning the low LEVELS of existing carbon prices (especially once sectoral, threshold and other exemptions are taken into account). Greater engagement with the political economy literature on the limits of carbon pricing (including but not limited to Rabe's study) is warranted here, e.g.: Jenkins (2014); Jenkins and Karplus (2017 book chapter); Mildenberger (2020 book). See also Jessica F. Green, "Does carbon pricing reduce emissions? A review of ex-post analyses" (2021).	Mildenberger added. ex-post assessment of carbon pricing impacts is covered in Chapters 2 and 13	Fergus Green	Utrecht University	Netherlands
12925	49	8	49	8	(Gheri et al., in review). Remove all citation not published yet	Reference to work now published	Amanullah Amanullah	Department of Agronomy, Thi	Pakistan
45445	49	12	49	21	A triple perfect storm is mentioned, but then only two out of the three aspects are in italics. It is not easy for the reader to discern exactly what the third identified "storm" is. There is also a grammatical mistake (I think) on line 18. Overall, the second part of this paragraph is somewhat obscure	Thanks clarified	Elena Verdolini	University of Brescia and Eur	Italy
22833	49	16	49	17	the reference concerning the citation 'The future whispers while the present shouts' is missing.	Deleted.	Government of France	Ministère de la Transition éco	France
48651	49	22	51	38	section 1.6.3 on ethical approaches (and see comments above re section 1.5.6); recommend more specific introduction of climate justice literature	This has been reworked in the process of our restructuring thank you	Lorraine Elliott	The Australian National Unive	Australia
85745	49	22	49	22	Suggest the work from Sampford on ethics, values and integrity might be useful in this section. See, for example: SAMPFORD, C. & WOOD, D. 1992. The Future of Business Ethics: Legal Regulation, Ethical Standard Setting and Institutional Design. <i>Griffith Law Review</i> , 1, 56-72.	This reference is relevant but dated so it has not been included.	Government of Australia	Department of Industry, Scie	Australia
3001	49	30	49	30	Should read 'Entrenching alternative...'	Thank you for this comment. Corrected the spelling	Beth Edmondson	Federation University	Australia
7953	49	33	49	37	I would add that in addition to "deeper values" we should also highlight "capital accumulation" as another key driver that is not addressed by "managerialist approaches"	Rejected - overloading for an Intro chapter on mitigation	Jevgeniy Bluwstein	University of Fribourg	Switzerland
74739	49	41	49	43	The alternative proposed to create a commission for detect and remove the reasons of tend to circumvent economic constraints that causes rising the threat of climate change.	Would need a literature reference to this idea, sorry	Mahnaz Ahmadi Namin	Meteorology Organization of	Iran
80919	49	43	49	45	Approaches criticizing the focus on growth/degrowth approaches should be mentioned.	These are now clearly if necessarily very briefly indicated	Heinz Wittenbrink	FH Joanneum University of A	Austria
14499	50	1	50	3	What do you mean by "general interests"? And I don't think that to "renew emphasis on trust and solidarity" counts as a "concrete" idea!	Amended, thanks	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
48653	50	2			re solidarity, ref also to Lorraine Elliott "Transnational environmental harm, inequity and the cosmopolitan response" in Peter Dauvergne (ed.) <i>Handbook of Global Environmental Politics</i> , Cheltenham: Edward Elgar, 2013, second edition.	This is a relevant text but it is dated and has not been included.	Lorraine Elliott	The Australian National Unive	Australia
4199	50	4	50	6	While I may agree with the position of the authors of this sentence, giving priority to 'short-term interest' is not necessarily immoral and under circumstances quite defensible. I would suggest a slightly less technocratic and managerial formulation of this and the next few sentences.	It has not been suggested that giving attention to short-term interest is immoral. Interest can be a force for good or bad depending on the context and how it is used.	Marcel Wissenburg	Radboud University Nijmegen	Netherlands
14501	50	5	50	5	What is "thought reflection"?	This has been corrected thank you	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
61239	50	5	50	5	instead of "thought reflection", perhaps "thoughtful reflection"?	This has been corrected thank you	Janne M. Korhonen	Lappeenranta University of T	Finland
14503	50	9	50	9	"It has been noted..." - by whom? This needs a source.	The text has been edited.	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
4201	50	27	50	30	I would suggest deleting this sentence. It is not followed by a concrete proposal - leaving the reader with the impression that IPCC suggests playing on people's emotions is a defensible alternative to addressing them as adults, citizens, persons and morally responsible individuals. Need I explain how intensely immoral and repulsive this is to a deontologist?	The text has been revised.	Marcel Wissenburg	Radboud University Nijmegen	Netherlands
22837	50	27	50	27	We recommend that with the advancements in neurosciences and advances in social and behavioral psychology, emotional intelligence and "collective intelligence" deserves a development as well, so many discoveries have been made in recent years. It is not only a question of approaching the subject through strategies of influence, but also and above all of taking into account the impact of social networks on the ability to change mentalities at a global level. The Gafams are working on this, but open source public policies cannot be absent from such a change.	This would be fascinating but the absence of references suggested, or space, we were unable to add text	Government of France	Ministère de la Transition éco	France
22861	50	33	50	34	We suggest that a reference to Kayal et al. 2019 can be added here in regard to these aspects of ethics and social justice of climate change	Rejected. This paper is just an assessment of another paper.	Government of France	Ministère de la Transition éco	France
48655	50	33	50	42	also asymmetry in access to adaptation	Accepted. We added a sentence on the capacity to implement mitigation and adaptation measures	Lorraine Elliott	The Australian National Unive	Australia
65261	50	33	51	38	Just transition and intergenerational equity are both known as 'rights-based approaches', which is backed by significant research including research prepared for the Human Rights Council on how rights-based approaches leading to more effective and ethical climate action. The AR6 WG2 includes rights-based approaches yet it is critical that the WG3 also includes findings on these approaches, for better and more effective (and being experienced as fair, they are more accepted by citizens). This particular paragraph would be an appropriate space - IPCC integration of related research from OHCHR, Special Rapporteurs and HRC findings, in turn strengthening linkages in intergovernmental/UN work.	Thanks for the comment. We do refer to several published studies in this section. While the studies prepared for the HRC are not necessarily published in peer reviewed journals or books, we follow the directions of IPCC and include peer reviewed publications.	Lindsey Cook	Quaker United Nations Office	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
22835	50	41	50	42	We suggest to clarify this statement to answer if the asymmetry in capacity also refers to capacity to implement emissions reductions	Accepted. We added a sentence on the capacity to implement mitigation and adaptation measures	Government of France	Ministère de la Transition écologique	France
14505	50	47	50	47	is "asymptotic" a useful word here? I would recommend using a more accessible term.	We have removed this word and rephrased the paragraph. Thank you	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
86485	51	4	51	7	This definition of "Just Transition" only refers to specific literature, and an overall IPCC definition for the scope of AR6 is missing, as discussed in other Comments. In addition, this definition of Just Transition is evidently inadequate as it does not include equitability across generations.	We refer to how it is usually referred to in the literature, but we have a paragraph on intergenerational equity, which we think meet your comment.	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
86487	51	7	51	7	I believe that the mention to the "No one left behind" phrase is not to be given lightly in an IPCC Report and I believe it should not be included in a scientifically rigorous and comprehensive discussion of Just Transition, if not when citing a specific literature source that mentions it, and promptly analyzing its context and feasibility within that context. I believe that the "No one left behind" phrase associated to an overall Just Transition discourse is inappropriate 1) Because it is often reported on discussions with a national or subnational focus 2) Because it almost never refers to frameworks including future generations 3) Because it is often used to justify the preservation of existing carbon-intensive sectors and the delay of timely climate action 4) Because it is practically impossible to be achieved in a transition, such as the climate transition, which is forcibly no longer incremental, gradual, or perfectly smoothable, given the carbon budget constraints to meet temperature goals starting from current emissions levels - while obviously every effort compatible with temperature targets should be taken to reduce unevenness in the distribution of the burden of the transition, across national population demographics, across all countries and across generations, in due proportion.	Accepted. This is now moved to 1.8.2	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
45447	51	9	51	11	A relevant recent reference here is Peñasco, C., Anadón, L.D., Verdolini, E. (2021) "Systematic review of the outcomes and trade-offs of ten types of decarbonization policy instruments". Nature Climate Change (doi: https://doi.org/10.1038/s41558-020-00971-x), a meta analysis assessing, among other things, the distributional impact of 10 policy instruments used to support decarbonization	Accepted. This is now moved to 1.8.2	Elena Verdolini	University of Brescia and Eurac	Italy
80921	51	10	51	10	"instruments" instead of "instrument"	This has been corrected thank you	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
77735	51	11	51	14	A wider range of measures to support a just transition (and not merely in relation to carbon pricing) is discussed by Green & Gambhir (2020), "Transitional assistance policies for just, equitable and smooth low-carbon transitions: who, what and how?"	Accepted. This is now moved to 1.8.2	Fergus Green	Utrecht University	Netherlands
22839	51	26	51	28	The sentence starting with "if climate" seems mistaken. It requires unconstrained intergenerational transfers that we don't have: future generations cannot transfer us their welfare gain from climate change mitigation to compensate for today cost.	The studies referred to explain ways all generations can benefit.	Government of France	Ministère de la Transition écologique	France
22841	51	32	51	33	In the statement "using governmental debt redeemed by future generations," please consider that current generations invest in this governmental debt	We do not really understand this comment. The idea is that a nation can take a loan to invest in mitigation, and this will be paid back by future generations.	Government of France	Ministère de la Transition écologique	France
22843	51	34	51	35	We recommend a clarification as it doesn't seem clear if what the level of responsibility of each generation is. Indeed, polluters are also previous generations.	This sentence is not about responsibility, but about taking the burden (cost) from the green transition.	Government of France	Ministère de la Transition écologique	France
48657	51	34			query re interpretation of 'polluter pays principle' which is an economic principle intended to counter public subsidies of private mitigation efforts	We have deleted the sentence on polluter pays principle.	Lorraine Elliott	The Australian National University	Australia
20059	51	40	54	19	Instead of delving directly into MLP, the analysis could start from the broader field of sustainability transitions and then make the distinction between the MLP and Systems of Innovations. In the current form of the section, TIS is completely missing, although it is explicitly mentioned as part of the Sustainability Transitions Research Agenda (Köhler et al., 2019). -Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wiecek, A., ... & Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. Environmental Innovation and Societal Transitions, 31, 1-32.)	We now refer to the other theories. Due to space constraints, we refer to Chapter 16 for a discussion of TIS etc.	Haris Doukas	National Technical University of Athens	Greece
31165	51	41	51	42	Here, the text distinguishes between transition as process and transformation as end state. However, it is unclear what literature is used for this approach. Perhaps the definitions are drawn from the MLP/transitions literature? In addition, this transformation/transition distinction does not seem to be in line with the glossary, which e.g. defines a societal (social) transformation in part as "A profound and often deliberate shift initiated by communities toward sustainability" (p. 47) i.e. a process not an end state. Similarly the glossary states a transition (p. 48) "can be based on incremental or transformative change", implying that transformative change is a component of, not an end result, of transition. In the growing literature reviewing mitigation-related transformations, it is often defined as a process: Fazez, Schöpke, et al. (2018, pp. 55–56, 10.1080/17565529.2017.1301864) define transformation as "a process leading to marked and qualitative change and processes that lead to fundamentally different forms of thinking, actions, systems and structures". Ellis and Tschakert (2019, p. 168, 10.1016/j.geoforum.2018.12.006) defined it as "a process of social change that challenges, and ultimately replaces, dominant development trajectories towards desirable low-carbon, climate-resilient futures".	We have changed the wording to be consistent with the glossary	Brendan Moore	University of East Anglia	United Kingdom (of Great Britain and Northern Ireland)
45449	51	41	53	22	To the very least, reference to Chapter 16 should be included here, as these are topics extensively discussed there, in particular sections 16.3 and 16.4. But, even better, this section should be linked to section 16.4, and checked across the content of 16.4 to avoid inconsistencies or partly contradictory expositions from the two parts. If the text here has somehow a different scope than the one in chapter 16, that should be clearly explained, either here, or there	Chapter 16 is now referenced	Elena Verdolini	University of Brescia and Eurac	Italy
45707	51	41			Please explain if the use of the terms transition and transformation is consistent with AR6 WG II, and explain if not.	Checked, the usage is consistent between WGII and WGIII, allowing for the sometimes slightly differing usage in the literature	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
47861	51	41	51	42	"This report uses the term transition as the process, and transformation as the outcome or objective, of large scale changes in technological, economic and social systems." The transition process or transformation outcome might not only refer to "large-scale changes", but also indicate the changes are happening in a systematic manner. I would suggest emphasizing "systematic". The proposed minor revision is "This report uses the term transition as the process, and transformation as the outcome or objective, of large-scale systematic changes in technological, economic and social systems."	The wording emphasises system transitions. It is now: This report uses the term transition as the process, and transformation as the overall change, of large-scale shifts in technological, economic and social systems, called socio-technical systems in the innovation literature.	Yuan Peng	The Australian National University	Australia

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
65987	51	41	51	42	Metamorphosis rather than transformation is needed to avoid the overshoot of the 1.5°C. See Ulrich Beck on Metamorphosis of the world. Please provide evidence that transformation would be enough.	We have not addressed the metamorphosis literature because of space constraints. However, a transformation in the sense used in the cited literature is the result of changes to achieve societal goals in sustainability e.g. the 1.5°C. A transformation may or may not be enough, it depends on whether and how the relevant transformation is implemented.	Yamina Saheb	OpenExp	France
45451	51	44	51	45	An S-curve model is proposed here, but this partly contradicts what is shown in Chapter 16, namely that innovation is non-linear and has several feedback loops (see also the figure is the SPM on this matter). The text here could perhaps better reflect that, and source if necessary from Chapter 16	We agree that figure does not emphasise the feedbacks. However, we do state that transition frameworks view the changes as a co-evolutionary process. We refer to chapter 16 for more details on the process and dynamics	Elena Verdolini	University of Brescia and Eur	Italy
70301	51	47	51	47	"asymptotic". Do you mean 'symptomatic'?	changed	Philippe Tulkens	European Union (EU) - DG Re	Belgium
20061	52	1	52	2	There are many more recent paradigms and references to be added to Turnheim et al., Geels et al., Hof et al. including: - Trutnevte, E., Hirt, L. F., Bauer, N., Cherp, A., Hawkes, A., Edelenbosch, O. Y., ... & van Vuuren, D. P. (2019). Societal transformations in models for energy and climate policy: The ambitious next step. One Earth, 1(4), 423-433. - Doukas, H., Nikas, A., González-Eguino, M., Arto, I., & Anger-Kraavi, A. (2018). From integrated to integrative: Delivering on the Paris Agreement. Sustainability, 10(7), 2299. - Sovacool, B. K. (2014). Diversity: energy studies need social science. Nature News, 511(7511), 529. - Tábara, J. D., Clair, A. L. S., & Hermansen, E. A. (2017). Transforming communication and knowledge production processes to address high-end climate change. Environmental Science & Policy, 70, 31-37. - Steg, L. (2018). Limiting climate change requires research on climate action. Nature climate change, 8(9), 759-761.	Due to space constraints, we cannot include the extra information - we refer to chapter 16 for more details of further frameworks.	Haris Doukas	National Technical University	Greece
20145	52	1	52	2	For multi-, inter-, and trans-disciplinary perspectives (not just multiple), please also consider: - Trutnevte, E., Hirt, L. F., Bauer, N., Cherp, A., Hawkes, A., Edelenbosch, O. Y., ... & van Vuuren, D. P. (2019). Societal transformations in models for energy and climate policy: The ambitious next step. One Earth, 1(4), 423-433. - Nikas, A., Lieu, J., Sorman, A., Gambhir, A., Turhan, E., Baptista, B. V., & Doukas, H. (2020). The desirability of transitions in demand: Incorporating behavioural and societal transformations into energy modelling. Energy Research & Social Science, 70, 101780. - Feola, G. (2020). Capitalism in sustainability transitions research: Time for a critical turn? Environmental Innovation and Societal Transitions, 35, 241-250. - Castree, N., Adams, W. M., Barry, J., Brockington, D., Büscher, B., Corbera, E., ... & Wynne, B. (2014). Changing the intellectual climate. Nature climate change, 4(9), 763-768. - Fuss, S., Canadell, J. G., Clais, P., Jackson, R. B., Jones, C. D., Lyngfelt, A., ... & Van Vuuren, D. P. (2020). Moving toward Net-Zero Emissions Requires New Alliances for Carbon Dioxide Removal. One Earth, 3(2), 145-149.	Due to space constraints, we cannot include the extra information - we refer to chapter 16 for more details of further frameworks.	Nikas Alexandros	National Technical University	Greece
43355	52	3	52	12	Currently, figure 1.8 lists only policies that push the transition. Perhaps it would be good to mention also the 'just transition' policies that cushion the negative consequences of transition. The figure nicely illustrates that the transition will be likely associated with collapsing firms and industries (the downward sloping curve) and likely job losses (e.g. in mining). It would be good to highlight in the figure that managing transition requires policies that protect the losers of the transition (Sovacool et al. 2019, Glob.Env.Change; COP24, 2018: JUST TRANSITION DECLARATION)	Good point, but we wanted to keep the diagram as simple as possible. We refer to	Jan Witajewski-Baltvilks	University of Warsaw	Poland
8975	52	6	52	8	Figure 1.8 does not describe any dynamics of transition, it describes only the narrative used to talk about transition.	Chapter 16 has a box on the dynamics of transition, we refer to.	Francesco Gonella	Ca' Foscari University of Veni	Italy
4381	52	7	52	8	Fig. 1.8, Add the Track and components of Dovetailing national points	We do not understand this comment	Alka Bharat	Maulana Azad National Instit	India
11115	52	7	52	7	I really like Figure 1.8. It would be particularly helpful if the contents in it were also reflected in Chapter 13.	We leave this to Chapter 13	Anthony Patt	ETH Zürich	Switzerland
50433	52	7	52	8	The curve of "Established Industries" (Yellow): Not sure whether appropriate to be included. It might not be symmetry with the "alternatives" and not all kinds of conventional technologies will be displaced in such trend.	This is however a very important aspect of the framework, that the established industries will either change or decline if a transformation is successful.	Hoy Yen Chan	ASEAN Centre for Energy	Malaysia
50435	52	7	52	8	Consider rephrasing the title of the figure. Suggest: Technological transitions in socio-economic system.	This is however not correct, the point of this frameworks is that social, economic, cultural and political factors co-evolve with technologies	Hoy Yen Chan	ASEAN Centre for Energy	Malaysia
22845	52	8	52	8	This diagram is a bit simplistic. Today, in most countries, governance is multi-level. Political and technological choices are made at both local and national level. We suggest to add a dimension of territorial development, which uses this notion of multi-level governance in this chapter.	We accept that the figure is simplistic. It is intended to indicate the main areas and features of the framework. The figure has been modified to indicate different levels of governance in the upper part of the new figure.	Government of France	Ministère de la Transition éc	France
45453	52	13	52	22	Section 16.4 presents a whole range of approaches, in addition to the MLP, to study innovation systems. Again, reference to Chapter 16 should be given and the texts of both this chapter and chapter 16 should be checked for consistency	Reference to chapter 16 added. This is already addressed below	Elena Verdolini	University of Brescia and Eur	Italy
70303	52	16	52	16	A period is missing.	Thanks	Philippe Tulkens	European Union (EU) - DG Re	Belgium
50587	52	18	52	23	Should the concept of socio technical system be defined earlier, in relation with figure 1.8?	Line added above	Anne Marie Treguier	CNRS	France
50589	53	1	53	1	I do not understand what "with some clear parallels" refers to in this sentence.	Deleted	Anne Marie Treguier	CNRS	France
50591	53	8	53	8	Does "these levels" refer to the levels of page 52, line 24? Overall I have difficulty to understand the difference between the two perspectives presented here.	Slight changes made	Anne Marie Treguier	CNRS	France
50593	53	9	53	9	It is unclear that this paragraph has something to do with uncertainty.	Uncertainty removed from paragraph title	Anne Marie Treguier	CNRS	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
20147	53	14	53	22	In the complementary methods and frameworks: how come TIS is not part of the methods described? It is in the same level as MLP, SNM and TM (see Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., ... & Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. <i>Environmental Innovation and Societal Transitions</i> , 31, 1-32.) Since other frameworks are named, why not Transformational Failures (see Weber, K. M., & Rohracher, H. (2012). Legitimizing research, technology and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive 'failures' framework. <i>Research Policy</i> , 41(6), 1037-1047.) and System Failures (see Woolthuis, R. K., Lankhuizen, M., & Gilsing, V. (2005). A system failure framework for innovation policy design. <i>Technovation</i> , 25(6), 609-619.) which can be integrated with TIS/SIS/etc. (e.g. Koasidis, K., Nikas, A., Neofytou, H., Karamaneas, A., Gambhir, A., Wachsmuth, J., & Doukas, H. (2020). The UK and German low-carbon industry transitions from a sectoral innovation and system failures perspective. <i>Energies</i> , 13(19), 4994; Koasidis, K., Karamaneas, A., Nikas, A., Neofytou, H., Hermansen, E. A., Vaillancourt, K., & Doukas, H. (2020). Many miles to Paris: A sectoral innovation system analysis of the transport sector in Norway and Canada in light of the Paris Agreement. <i>Sustainability</i> , 12(14), 5832)?	Reference to TIS and reference to chapter 16 added	Nikas Alexandros	National Technical University	Greece
80923	53	21	52	21	Grammar? Better something like: "interaction being made explicit".	Thank you, added the word "made" to clarify	Heinz Wittenbrink	FH Joanneum University of A	Austria
12927	53	39	53	39	(Kuzemko et al (2016)). Write as (Kuzemko et al., 2016).	Thank you	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
20149	53	41	53	42	Along with Woiwode (2013), more recent references: - Nikas, A., Lieu, J., Sorman, A., Gambhir, A., Turhan, E., Baptista, B. V., & Doukas, H. (2020). The desirability of transitions in demand: Incorporating behavioural and societal transformations into energy modelling. <i>Energy Research & Social Science</i> , 70, 101780. - Sorman, A. H., Turhan, E., & Rosas Casals, M. (2020). Democratizing energy, energizing democracy: Central dimensions surfacing in the debate. <i>Frontiers in Energy Research</i> , 1-6.	reference to Sorman added: Sorman, A. H., Turhan, E., & Rosas Casals, M. (2020). Democratizing energy, energizing democracy: Central dimensions surfacing in the debate. <i>Frontiers in Energy Research</i> , 1-6.	Nikas Alexandros	National Technical University	Greece
22847	54	3	54	3	It seems that the title does not correspond to the content of the paragraph	changed	Government of France	Ministère de la Transition éc	France
20063	54	8	54	9	Possible reference to underpin last sentence: e.g. Nikas, A., Neofytou, H., Karamaneas, A., Koasidis, K., & Psarras, J. (2020). Sustainable and socially just transition to a post-lignite era in Greece: a multi-level perspective. <i>Energy Sources, Part B: Economics, Planning, and Policy</i> , 15(10-12), 513-544.	reference to Nikas et al added Nikas, A., Neofytou, H., Karamaneas, A., Koasidis, K., & Psarras, J. (2020). Sustainable and socially just transition to a post-lignite era in Greece: a multi-level perspective. <i>Energy Sources, Part B: Economics, Planning, and Policy</i> , 15(10-12), 513-544.	Haris Doukas	National Technical University	Greece
50597	54	20	54	20	I find surprising that psychology and behavior are discussed in the same framework as politics, and not in the "ethics and values" framework. Is this usual in the literature? Is there a specific reason why?	Title for 1.7.6 changed to make it clear that we are no longer talking about transitions literature	Anne Marie Treguier	CNRS	France
12929	54	23	54	23	Seto et. al (2016) write as Seto et al. (2016)	This reference has been removed. Thank you	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
72439	54	27	54	27	Table last line: "e.g., QWERTY": what is the meaning? missing example?	Qwerty reference expanded	Sylvain Pichat	University of Lyon, Ecole nor	Germany
83017	54	27	54	28	Given that the overall share of renewable energy isn't impressively high in Germany, maybe better to go with "electricity" instead of "energy"	Done	Geden Oliver	German Institute for Internat	Germany
84533	54	29	55	1	Please add the following new paragraph: "In a complementary interdisciplinary approach, Karlsson and Gilek (2019) presents a framework for analysis of "delay mechanisms" in both science and policy, including science denial and decision thresholds." and the reference "Karlsson, M., Gilek, M. (2019) Mind the gap: Coping with delay in environmental governance. <i>Ambio</i> 49, 1067–1075 (2020). https://doi.org/10.1007/s13280-019-01265-z "	Interesting, added	Mikael Karlsson	KTH Royal Institute of Techn	Sweden
22849	54		54		In Table 1.1, concerning the line Behavioural, and concerning the statement "Lock-in through social structure (e.g., norms and social processes)" we suggest to add the "zapping" effect of public policies that make policies to fight CR overtaken by other policies related to covid 19 and the emergence of other impacts, including the need to revive the economy "at all costs"	Would need a ref. Covid-realted issues are covered in the X-chapter box	Government of France	Ministère de la Transition éc	France
12931	55	3	55	3	and Ellis (2016), p.642).remove page number	Thank you	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
12933	55	6	55	6	(e.g. Kahneman 2003), correct as (e.g. Kahneman, 2003).	Thank you	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
50595	55	11	55	11	I am not sure I understand the precise analogy with COVID19 in this sentence.	reference to COVID-19 deleted. Agreed that the analogy is imprecise and not crucial.	Anne Marie Treguier	CNRS	France
12935	55	17	55	17	Mulainathan (2010, p. 1204). Correct as Mulainathan (2010).	Thank you	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
80925	55	17	55	19	Could the roles of media and especially advertising be mentioned?	Stuck for space - the refs should help lead people to that literature	Heinz Wittenbrink	FH Joanneum University of A	Austria
3003	55	31	55	31	The influence of interest groups on policy-making also varies over time within countries and not all interests groups influence policy developments in the same ways.	The paragraph as it recognises this variation, while putting the emphasis on influence that blocks climate action. I have not been able to find any scientific literature that analyses how such influence varies across time so I don't see how we can deal with this comment. There is plenty of analysis of variation across different countries, which is dealt with in paragraph 215.	Beth Edmondson	Federation University	Australia
77737	55	31	55	36	Additional key references here are: Jared Finnegan's 2019 Grantham Institute working paper "Institutions, climate change, and the foundations of long-term policymaking"; and Wood et al. 2020, "The comparative institutional analysis of energy transitions"	Thank you. Wood et al reference added. Finnegan is at the moment just a working paper so propose to leave out.	Fergus Green	Utrecht University	Netherlands
5065	55	39	55	45	In case you want to add a real-life example, the UK's Climate Change Committee might fit in well	Space I think precludes introducing these examples. the Dubash forthcoming reference refers to research focused on multiple cases of this institutional development, and goes significantly beyond the UK climate change committee as the 'iconic case'.	Lina Hollender	n/a	Germany
61159	55	39	56	28	This section on socio-political approaches is heavily focused on institutional factors. Consider the role of social movements in initiating change as outlined in Smith, Christie and Willis (2020) "Social tipping intervention strategies for rapid decarbonization need to consider how change happens" www.pnas.org/cgi/doi/10.1073/pnas.2002931117 , which was written in response to Otto et al., Social tipping dynamics for stabilizing Earth's climate by 2050. <i>Proc. Natl. Acad. Sci. U.S.A.</i> 117, 2354–2365 (2020).	The proposed addition is a letter (one page) not a research article so I don't think appropriate to cite. The article it responds to does not make the point the commenter wants us to include - their letter is a response to that article saying social movement agency needs to be more explicitly recognised. The point is an important one and the comment is correct that the section is focused on institutional questions. There is a whole paragraph (217) on social movements in there with plenty of examples of movement agency, and even if it is focused on how institutions mediate social movement action, it does emphasise that the literature demonstrates the importance of social movement agency to shaping institutional responses. Propose to leave as is.	Steven R Smith	CES, University of Surrey	United Kingdom (of Great Britain and Northern Ireland)
61083	55	42	55	45	Dubash, forthcoming is cited in text, which is not in the references. Further, please check if IPCC allows forthcoming articles in assessment reports. Please check if there is a cut-off date set for this AR, for consideration of published literature.	Thank you, IPCC allows us to mark as forthcoming as long as they are published by the deadline of October 11th	LOKESH CHANDRA DUBE	TERI School of Advanced Stud	India
12937	55	45	55	45	change (Dubash, forthcoming). Delet it	See response to comment 61083	Amanullah Amanullah	Department of Agronomy, TH	Pakistan

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
84535	55	55	60	3	Please add figure 1 from "Karlsson, M., Gilek, M. (2019) Mind the gap: Coping with delay in environmental governance. <i>Ambio</i> 49, 1067–1075 (2020). https://doi.org/10.1007/s13280-019-01265-z	I don't think we have space for this. The figure is a broad figure schematically setting out a set of processes that contribute to delay in policy across various environmental governance domains. It is not quite clear why the commenter wants to put this in this paragraph focused on social movement relations to climate policy and institutions specifically. It would make more sense perhaps connected to paragraph 209 but it would require significant discussion then as to how well it captures the analysis in this section. propose to leave this.	Mikael Karlsson	KTH Royal Institute of Techno	Sweden
14507	56	1	56	11	On NGO action and divestment, I recommend the following excellent references: Julie Ayling & Neil Gunningham (2017) Non-state governance and climate policy; the fossil fuel divestment movement, <i>Climate Policy</i> , 17:2, 131-149, DOI: 10.1080/14693062.2015.1094729; Giorel Curran (2020) Divestment, energy incumbency and the global political economy of energy transition: the case of Adani's Carmichael mine in Australia, <i>Climate Policy</i> , 20:8, 949-962, DOI: 10.1080/14693062.2020.1756731	Both of these are good pieces on divestment, as is the one cited already. there is a large literature however on this and on the other social movement campaigns mentioned	Joanna Depledge	Centre for Environment, Ener	United Kingdom (of Great Britain and Northern Ireland)
3005	56	3	56	3	Using a source that is 18 years old too mount an argument about current and into the future actions and patterns is highly problematic. While Dryzek's work was important in considering NGO-government relations, a great many new factors, issues, relational dynamics, systems of influence have emerged since this work was published.	This refers to Dryzek 2003 cited in para 213. I disagree. this is a 'classic text' in the field, and the specific argument about how states relate to social movements is important to how 'transformative' environmental governance and policy that is made there is the point that book set out and more recent literature (as cited later in the paragraph) is built on. Propose to leave Dryzek reference there.	Beth Edmondson	Federation University	Australia
77739	56	3	56	5	It is not only campaigns on fracking and divestment that are relevant here, but campaigns concerning the whole fossil fuel supply chain (coal-mining; coal-fired power generation; coal ports; LNG terminals; oil pipelines etc.). There is plenty of academic literature on this. See e.g. Temper et al. (2020) in ERL. Also relevant here is Fergus Green, "Anti-Fossil Fuel Norms" (2018), concerning the key role of activist campaigns in generating ideas and norms that challenge the legitimacy of the fossil fuel industry.	Listing all the campaigns is not possible for space reasons, but 'and others' added to recognise that there are other campaigns of this sort. Green 2018 reference added as useful additional general reference on this development, and underscores the point about shifts in key ideas and norms underpinning policy.	Fergus Green	Utrecht University	Netherlands
2073	56	5	56	6	The mention of the limitations of a 'managerialist' approach (page 49, lines 33 – 37) and the statement "Attempts to treat climate change as 'post-political' result in poor policy responses" point to an important critique of the overall post-political framing of climate change that is embodied in this IPCC report (Swyngedouw 2011:264). This lack of reflexivity on the part of the IPCC AR6 WG3 report is illustrated throughout this report.	No specific suggestion made for revisions at this point in the text.	Robert Brulle	Brown University	United States of America
2075	56	5	56	6	The post-political frame is characterized as being "structured around the perceived inevitability of capitalism and a market economy as the basic organizational structure of the social and economic order, for which there is no alternative" (Swyngedouw 2010:215, also see Kenis and Lievens 2014 and Reusswig and Lass 2010:167). Adoption of this perspective narrows the range of policy options considered to address climate change to those that are in accord with existing social, political, and economic relationships, thus limiting political action to consensual approaches, such as individual behavioral change and market-oriented ones such as emissions trading, thereby avoiding more conflictual strategies (Kenis and Lievens 2014). The post-political ideology dominates and steers the work of the IPCC (Anshelm and Hultman 2015, Remling 2016, Bäckstrand and Löfbrand 2016, Swyngedouw 2018, MacNeil and Paterson 2012, Brulle and Dunlap 2015, Wilson and Swyngedouw 2015). Rather than providing relevant information to guide a major societal transition toward sustainability (O'Riordan 2013), the reformist framing of climate change has developed in accord with the governing principles of late modern society (Blühdorn 2000:30) and itself constitutes a form of social inertia that limits actions to address climate change to marginal, incremental measures in line with the status quo.	This is a major substantive critique of the whole chapter, report and IPCC as a whole. I am not sure how it can be dealt with in this paragraph, although I take it at least as support for mention of it in this context (just wishing the report went much further in recognising the importance of these insights). 'post-political' has been changed to 'depoliticisation' as in the response to comment 7539 - this then loses the specificity of 'post-political' as specified here by the commenter, and it is the case that that sentence is more narrow than the commenter here wants, in that it is about how closing down space for political contestation weakens policy responses, so more specific than the broader debates implied by the term 'post-political'. From the references suggested in the comments below, a selection of those that speak to this specific point have been added.	Robert Brulle	Brown University	United States of America
2077	56	5	56	6	The placement of the mention of the post-political ideology shows that while the IPCC is aware of this literature, it doesn't actually take it seriously. There is no real engagement with the critique of the work of the IPCC offered by the literature. Hence the statement above that "Attempts to treat climate change as 'post-political' result in poor policy responses" applies to the IPCC AR6 WG3 report. So the issue becomes whether the IPCC can actually be reflexive about its own work and acknowledge that it is working within the unacknowledged post-political ideology, with all of the limits that come with that perspective. In a framings chapter, it would seem to me to be important to at least acknowledge the implicit framings that guide the entire report and how they limit the nature of the analysis.	Same response as previous comment. It is clear that such a reflection, were it to be undertaken, would have to be much broader than one chapter and much earlier than in the last round of comments and revisions.	Robert Brulle	Brown University	United States of America
2079	56	5	56	6	Anshelm, J & M. Hultman. 2015. <i>Discourses of Global Climate Change</i> . Routledge, New York.	reference left out. see explanation in response to comment 2075.	Robert Brulle	Brown University	United States of America
2081	56	5	56	6	Bäckstrand, K. and E. Löfbrand. 2016. <i>The Road to Paris</i> . <i>Journal of Environmental Policy & Planning</i> 1-19.	reference left out. see explanation in response to comment 2075.	Robert Brulle	Brown University	United States of America
2083	56	5	56	6	Blühdorn, Ingolfur. 2000. <i>Post-ecologist Politics</i> . London: Routledge.	reference left out. see explanation in response to comment 2075.	Robert Brulle	Brown University	United States of America
2085	56	5	56	6	Brulle, R. and R. Dunlap. 2015 Chapter One in R. Dunlap and R. Brulle (Eds.) <i>Sociological Perspectives on Climate Change</i> Oxford: New York	reference left out. see explanation in response to comment 2075.	Robert Brulle	Brown University	United States of America
2087	56	5	56	6	Kenis, A. and M. Lievens. 2014. "Searching for 'The Political' in Environmental Politics." <i>Environmental Politics</i> 23:531-548.	reference added.	Robert Brulle	Brown University	United States of America
2089	56	5	56	6	MacNeil, R. and M. Paterson. 2012. Neoliberal climate policy. <i>Environmental Politics</i> 21(2):230-247.	reference left out. see explanation in response to comment 2075.	Robert Brulle	Brown University	United States of America
2091	56	5	56	6	O'Riordan, T. 2013. "Future Earth and Tipping Points." <i>Environment</i> 55(5):31-40.	reference left out. see explanation in response to comment 2075.	Robert Brulle	Brown University	United States of America
2093	56	5	56	6	Reusswig, Fritz and Wiebke L. 2010. "Post-Carbon Ambivalences." <i>Science, Technology & Innovation Studies</i> 6:156-181.	reference left out. see explanation in response to comment 2075.	Robert Brulle	Brown University	United States of America
2095	56	5	56	6	Swyngedouw, Erik. 2010. "Apocalypse Forever?" <i>Theory, Culture & Society</i> 27(2-3):213-232.	this reference is already cited at this point	Robert Brulle	Brown University	United States of America
2097	56	5	56	6	Swyngedouw, Erik. 2011. "Depoliticized Environments." <i>Royal Institute of Philosophy Supplement</i> 69:253-274.	reference added.	Robert Brulle	Brown University	United States of America
2099	56	5	56	6	Swyngedouw, E. 2018. <i>CO2 as neoliberal fetish</i> , pp. 295 – 307 in Cahill, D, Copper M, and D. Primrose (Eds) <i>Handbook of Neoliberalism</i> Sage London.	reference left out. see explanation in response to comment 2075.	Robert Brulle	Brown University	United States of America
2101	56	5	56	6	Wilson, J. and E. Swyngedouw (Eds.) 2015. <i>The Post-Political and Its Discontents</i> . Edinburgh UK: Edinburgh University Press	reference left out. see explanation in response to comment 2075.	Robert Brulle	Brown University	United States of America
7539	56	5	56	5	I would suggest rewording this sentence to reflect the issue with depoliticisation more broadly rather than post-politics specifically. Furthermore, depoliticisation (or a post-politicising) process/discourse is one in which there is an attempt to foreclose or narrow democratic space and contestation. My suggestion would be to more clearly articulate this in this sentence. For example "Attempts to depoliticise climate change may result in narrowed space for democratic participation and contestation, thus impacting policy responses."	Thank you, this is a helpful clarification and the commenter is correct - this passage is really about depoliticisation rather than the broader concept of post-politics. this is changed as suggested.	Raven Cretney	University of Waikato	New Zealand

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
86489	56	5	56	6	"Attempts to treat climate change as 'post-political' result in poor policy responses (Swyngedouw 2010)." I believe this sentence should be removed as it is a poor account of the message and nature of the source cited. The source cited is a free discussion containing some literature survey, and it is not an observational study on the relative effectiveness of those climate policies that derived from approaches free of political/ideological discourse - as the phrase "result in poor policy responses" conveys. I believe that it is much easier to provide observational evidence that the over-politicization of climate policies is much more prevalent and has resulted in poor policy response. If a discussion of politicization of policies really needs to be included, a comprehensive survey of studies relevant to the subject, especially observational, should be presented. If such material is not available, the issue should not be presented.	Thank you. there is literature on how politicisation - understood rather narrowly as climate change being the object of partisan conflict - can block climate policy, but this is almost solely about the United States (one or two references to Australia). The literature cited here uses a broader account of politicisation and is based on research on a broader range of countries. The sentence has been revised in line with comment 7539, some additional references added, and is defensible.	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
14509	56	19	56	19	What is "the FT programme"? Also, this would be a much better and more recent reference on Ontario: Leigh Raymond (2020) Carbon pricing and economic populism: the case of Ontario, Climate Policy, 20:9, 1127-1140, DOI: 10.1080/14693062.2020.1782824	This is a typo - should read FIT programme - if it needs to be spelled out then Feed-in-Tariff, but FIT is well enough known as an acronym. typo corrected. Re the reference, thank you, reference added. The Stokes piece is kept however, it is also excellent.	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
50599	56	20	56	20	here "gilets jaunes", but "yellow vests" earlier, should the reference be the same everywhere?	have changed to yellow vest here, that is more commonly used in the chapter.	Anne Marie Treguier	CNRS	France
50601	56	30	56	30	it would be useful to list again here the four frameworks, to help the reader remind them.	Comment redundant given chapter restructuring. It was on the following section to what is now 1.7.6 in any case, not 1.7.6 itself.	Anne Marie Treguier	CNRS	France
86491	56	46	57	1	I believe that "sufficient" is the key word when we refer to minimizing unevenness among actors in the present time. The text should be edited to clarify that "sufficiency" of equality is obviously relevant only when applied to effective transitions (i.e. transitions that are successful in meeting temperature targets). In addition, this should not be related to the term "Just Transition" (in the line above) because the term "Just Transition" should encompass equality and justice not only across space, but also across time, i.e. considering the burden for future generations.	Not convinced this needed elaboration	Lorenzo Campus	Ca' Foscari University of Venice	United States of America
50603	57	6	57	6	why are there references to chapter 4 (mitigation in the near term) but not to chapter 3 (mitigation in the long-term)? Does the framework apply to both?	Because chapter 4 goes into much more depth including in relation to the policy and political context	Anne Marie Treguier	CNRS	France
4383	57	14	57	14	pt. 1.7 clearly add the position of national interventions	The Governance section has been radically rewritten and shortened for the final draft	Alka Bharat	Maulana Azad National Institute of Technology	India
6913	57	14	59	39	It might be useful that this section draws lessons from the global response to the COVID-19 pandemic for multi-level governance in the context of large-scale global climate change catastrophe.	The Governance section has been radically rewritten and shortened for the final draft	Debra Roberts	EThekweni Municipality	South Africa
8977	57	14	59	39	The narrative developed in the whole Section 1.7 is heavily anthropocentric. Climate change emergency is much more than a threat to our economy. The complexity of the issue is often addressed only as complexity of policies, synergies, trade-offs, challenges, opportunities, risks, development, assets, efficiency, governance, innovation, power, action. All true, of course, but this remains only one face of the scientific complexity that we have to address.	The section has been revamped. However it should be noted that the native developed here does not focus on economy alone. In several places it has been stated that the objective is climate mitigation in the context of sustainable development and efforts to eradicate poverty.	Francesco Gonella	Ca' Foscari University of Venice	Italy
50613	57	14	59	39	This section does not seem focussed on "multi-level" governance. Many concepts are presented in a general fashion (for example "free riding", equity) and not explicitly related to the "multi-level" aspect. The section does not explain why multi-level governance is important for, and used in, the other chapters of WGIII. Perhaps this section is meant to refer to "governance" in general, not just "multi level"? Could the purpose of this section be made more explicit?	Thank you. The section has been revamped and the suggestion to change the title and emphasis to governance as a whole has been adopted.	Anne Marie Treguier	CNRS	France
51883	57	14			The section discusses Multi-level governance formulated around implementation Paris Agreement. The discussion should be around enabling UNFCCC	The section has been revamped and the discussion broadened to climate action in general.	Government of Saudi Arabia	Sustainability Advisor to the Government of Saudi Arabia	Saudi Arabia
78293	57	14	59	39	This is a lot of material in Chapter 1 for a topic picked up in Chapters 13 and 14.	We agree. The section has been revamped and shortened.	Jim Skea	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
79967	57	14	59	39	I strongly recommend, as a reference for the multilevel governance sections here, the publication by Muller et al (2017). Forging low emission development paths in Latin America: Multilevel dynamics in the world's most urbanized region. London: Low Emission Development Strategies Global Partnership. https://www.weadapt.org/knowledge-base/governance-institutions-and-policy/forging-low-emission-development-paths-in-lac The authors touch on innovations, concluding: "Although multilevel governance and intersectoral collaboration towards domestic implementation of the NDCs and long term LEDs in LAC is still incipient, there are important examples of progress. These include: the creation of interministerial climate cabinets; national councils comprised of multiple levels of government as well as civil society; cities providing important leadership and regional input to national policy; intermunicipal cooperation to reduce fragmentation; regional climate change science and strategic action committees; and national networks of municipalities on climate change."	The section has been revamped and the emphasis is now on governance more broadly. However the role of effective institutions in facilitating climate action at national, regional and global level has been underlined as is the important of coordination and networks.	Mairi Dupar	Overseas Development Institute	United Kingdom (of Great Britain and Northern Ireland)
86881	57	14	59	39	Section 1.7 could make a clearer connection between municipal or urban governance and subnational + multilevel governance; etc., and generally make reference to Chapter 8, as well as Chapter 13, as a chapter that delves into this topic.	The section has been revamped and the role of governance at local, national including urban centers have been stressed.	Meredith Keller	Yale University	United States of America
20151	57	15	57	23	Multi-level governance is perceived critical even in futures featuring rapid technological development, as single governance structures could give rise to weak, unstable institutions and regulatory/monitoring frameworks and monopoly business interventions. - Song, L., Lieu, J., Nikas, A., Arsenopoulos, A., Vasileiou, G., & Doukas, H. (2020). Contested energy futures, conflicted rewards? Examining low-carbon transition risks and governance dynamics in China's built environment. Energy Research & Social Science, 59, 101306. - Di Gregorio, M., Fatorelli, L., Paaola, J., Locatelli, B., Pramova, E., Nurrochmat, D. R., ... & Kusumadewi, S. D. (2019). Multi-level governance and power in climate change policy networks. Global Environmental Change, 54, 64-77.	The advantages of multilevel governance has been noted and the reference has been used. Thank you	Nikas Alexandros	National Technical University of Athens	Greece
50605	57	15	57	15	I find this sentence is a bit difficult to follow. "multiple factors that can both": why is "both" used here?	Edited, thank you.	Anne Marie Treguier	CNRS	France
3007	57	22	57	42	Relying upon dated sources when arguing that extending current multi-level governance and approaching systemic complexities in new ways is problematic.	The section has been edited and references updated.	Beth Edmondson	Federation University	Australia
50459	57	29	57	30	"Choices and decisions made in several other aspects of life": others relative to what? How does this sentence connect with the previous sentence?	The section has been revamped and this sentence edited.	Anne Marie Treguier	CNRS	France
50465	57	36	57	44	In which way does this paragraph relate to the "multi level" concept, which is the title of this subsection?	The section has been revamped and the paragraph edited	Anne Marie Treguier	CNRS	France
50461	57	37	57	39	Quotes do not match.	Thank you we have streamlined the style here	Anne Marie Treguier	CNRS	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
50463	57	39	57	41	I am not a specialist, but I wonder, could this sentence be linked to the previous one in a better way? Explain better what multiple choices the trade-offs are between. Also, "trade-offs not only against benefits ... but also planetary risks" is difficult to follow for me. do you mean "against planetary risks"?	Thank you. The section has been revamped and the sentence in question edited.	Anne Marie Treguier	CNRS	France
4385	57	44	57	44	After line 44 ... Add 'Action Plan'	The sentence has been edited.	Alka Bharat	Maulana Azad National Institute of Technology	India
3009	58	1	59	6	Section 1.7.2 does not really present anything that hasn't already been outlined. Suggest deleting this section	The section has been revamped to bring out its added value.	Beth Edmondson	Federation University	Australia
50467	58	2	58	3	What are the other activities, and why is "proceeding in parallel" an important point to make here? Perhaps merging this paragraphs with the following one could make the "context of much broader...goals" easier to grasp?	The section has been edited.	Anne Marie Treguier	CNRS	France
80927	58	2	58	2	Omission. Better: "in an increasingly"	Thank you, accepted	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
48659	58	3		4	see comment 21 above re definition of regime complex	The Governance section has been radically rewritten and shortened for the final draft	Lorraine Elliott	The Australian National University	Australia
48661	58	7			governance arrangements' required (insert 'arrangements')	This has been corrected thank you	Lorraine Elliott	The Australian National University	Australia
25105	58	11	58	28	The bolded sentence is power dynamics but do the second and third para fit under power dynamics? You could classify these under cooperation or similar?	The section has been revamped and the bold statements are gone.	Minal Pathak	WGIII TSU, Ahmedabad University	India
50469	58	19	58	19	Please spell "Sustainable development" in full.	We have defined this earlier in the chapter and maintain the use of SD.	Anne Marie Treguier	CNRS	France
50471	58	21	58	21	What does the word "this" in the sentence refer to? "trade measures to encourage participation"?	The section as well as this line has been edited.	Anne Marie Treguier	CNRS	France
50473	58	29	58	39	This two paragraphs seem to be about equity rather than about the role of institutions (section 1.5.6 could be referenced here).	The section has been revamped and this sentence edited	Anne Marie Treguier	CNRS	France
10201	58	40	58	42	Sentence doesn't make sense - no obvious typo, impenetrable construction.	The section has been revamped and the sentence edited.	Gary Kendall	Nedbank	South Africa
50475	58	41	58	41	What does "self-consciously" mean in the context of the sentence?	The sentence has been edited.	Anne Marie Treguier	CNRS	France
80929	58	41	58	41	"self-conscient" instead of "self-consciently"	The sentence has been edited.	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
80931	58	41	58	41	"seeking progress" instead of "seeking process" (?)	The sentence has been edited.	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
25107	59	10	59	13	Does this result in policy blockage? Is it not a one-sided view of multi-level participation of subnational actors?	Some balance has been restored with a highlight on the strengths and weakness of MLG	Minal Pathak	WGIII TSU, Ahmedabad University	India
45755	59	10	59	12	It should be noted that the one study cited (Fisher and Leifeld 2019) refers to climate politics in the USA only as the cultural, socio-political and economic context play an important role. In addition, it should also be noted there are other studies emphasising the need for multi-level participation in governance systems in order to build coalitions to support climate change mitigation policies. (See for example: Roberts, C., M. Lockwood, P. Newell, H. Schmitz, B. Turnheim, and A. Jordan, 2018: The politics of accelerating low-carbon transitions: Towards a new research agenda. Energy Res. Soc. Sci., 44, 304–311, https://doi.org/10.1016/j.erss.2018.06.001 Harrison, T., G. Kostka, 2012: Manoeuvres for a Low Carbon State—The Local Politics of Climate Change in China and India, Developmental Leadership Program http://www.dlprog.org/publications/manoeuvres-for-a-low-carbon-state-the-local-politics-of-climate-change-in-china-and-india.php)	Thank you. This point on the strength of multi-level participation has been incorporated.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
80933	59	14	59	14	better: "systematic understanding of the role of power"	Text has been edited.	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
48663	59	16		20	re fragmentation - take account of Biermann et al who describe fragmentation as having the potential to take cooperative and even synergistic forms; F. Biermann et al., 'The Fragmentation of Global Governance Architectures: A Framework for Analysis', Global Environmental Politics 9(4) (2009),	The point has been made and reference noted, thank you.	Lorraine Elliott	The Australian National University	Australia
80935	59	16	59	17	"Om one hand" and "On other hand" is superfluous and misleading, one is a consequence of the other.	Text has been edited.	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
83019	59	21	59	24	Please also consider the Victor/Geels/Sharpe 2019 report on the role of international cooperation in sectoral decarbonisation https://www.brookings.edu/research/accelerating-the-low-carbon-transition/	The role of international coo-operation has been noted.	Geden Oliver	German Institute for International and Development Studies	Germany
27557	59	24	59	28	Delete "However, given the embedding of fossil energy not only in production but in consumption and thus daily life (Paterson 2007; Bulkeley et al. 2016; Szeman and Petrocultures Research Group), much of the resistance to climate policy is not necessarily only by incumbent industries but from threats to established habits and practices taking account of geography and domestic politics etc. (Chandrashekar 2016)." as the PA implementation is not exclusively related to the energy sector.	The text has been deleted.	Eleni Kaditi	Organization of the Petroleum Producers	Austria
80937	59	27	59	27	What is meant with "practices taking account of geography ..."?	The text has been deleted.	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
50477	59	31	59	31	"three roles" is unclear in this sentence. Perhaps say "three themes", as in Roberts et al 2018?	The text has been edited out.	Anne Marie Treguier	CNRS	France
80939	59	32	59	39	Studies about media and climate communication are not mentioned.	We do not think this is directly relevant but we have mentioned the role of governance in increasing awareness which implies the role of media and communication.	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
50481	59	41	60	26	It is unclear to me what the purpose of this short conclusion is. Is it intentional that it includes not reference? This conclusion seems to have a strong focus on section 1.6 (four frameworks). If a conclusion is needed here, perhaps it could focus on providing additional support to key overarching E.S. statements of this chapter, or enhance the role of chapter 1 as a "gateway" to the WGIII report.	Text has been revised.	Anne Marie Treguier	CNRS	France
60717	59	41	60	26	Conclusions are numerous and arguably most informative; however, it is being suggested that confidence levels be indicated if at all possible.	The Governance section has been radically rewritten and shortened for the final draft	Lourdes Tibig	Climate Change Commission	Philippines
80941	59	44	59	44	is "unambiguous" the right word für impacts?	The word is useful in the context of continued climate denial sentiment. It makes it clear that there is no question that climate change will have significant negative impacts on society.	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
14511	59	45	59	45	"movements in society" - not sure what you mean.	The Governance section has been radically rewritten and shortened for the final draft	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
50479	59	45	59	45	"movements in society ... have grown": do you mean physical movements, or evolving organizations, or the motion of ideas?	The Governance section has been radically rewritten and shortened for the final draft	Anne Marie Treguier	CNRS	France
14513	60	1	60	1	"nationally declared contributions" - the correct term must be used. It was carefully negotiated: "nationally determined contributions". By now all such mentions should surely be given as the acronym NDC anyway.	Thank you	Joanna Depledge	Centre for Environment, Energy and Sustainability	United Kingdom (of Great Britain and Northern Ireland)
22851	60	1	60	2	to explicit steps towards a concrete solution, we suggest completing the sentence with "... inconsistent with the agreed Paris goals, highlighting the need for establishing enforcement policies."	The Governance section has been radically rewritten and shortened for the final draft	Government of France	Ministère de la Transition écologique et solidaire	France
48665	60	1			have adopted 'net zero emission goals and decarbonisation or low carbon growth strategies	accepted thank you	Lorraine Elliott	The Australian National University	Australia

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65989	60	1	60	1	The timeframe of net zero emissions goal is not consistent with the timeframe for the remaining carbon budget	The Governance section has been radically rewritten and shortened for the final draft	Yamina Saheb	OpenExp	France
8979	60	4	60	5	This is true only if decoupling may be proved to be actually a feasible option, that remains highly questionable for biophysical reasons. Otherwise, the sentence as it is stated is unacceptable.	The Governance section has been radically rewritten and shortened for the final draft	Francesco Gonella	Ca' Foscari University of Venice	Italy
14515	60	4	60	4	Should read "...can only be *effectively* tackled..."	The Governance section has been radically rewritten and shortened for the final draft	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
14517	60	8	60	8	"Developed countries are amongst the most unsustainable in terms of overall consumption...". This over-generalisation is too simplistic, not least because of the differences between income groups within countries. Please rephrase.	The Governance section has been radically rewritten and shortened for the final draft	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
65991	60	8	60	8	I suggest introducing here the concepts of consumption corridors and sufficiency to tackle the overconsumption of the global North	The Governance section has been radically rewritten and shortened for the final draft	Yamina Saheb	OpenExp	France
80943	60	15	60	15	"including relating" is stylistically not nice (?). Better "including the inquiry into relationships" or something like that.	Thank you, Reworded this into "including the relationship with international..."	Heinz Wittenbrink	FH Joanneum University of Austria	Austria
80945	60	24	60	26	"deepen and broaden the scattered elements" is a strange metaphor.	replaced "broaden" with "connect"	Heinz Wittenbrink	FH Joanneum University of Austria	Austria
60719	60	27	61	8	Likewise, the knowledge gaps are just being enumerated. If the intention is so, then a revision is in order. There is no cohesion in the narrative. Tighten the discussion of these important knowledge gaps.	Thank you for this comment. The intention is for the section to be more list-like, but the flow has been improved.	Lourdes Tibig	Climate Change Commission	Philippines
75937	60	27	61	8	Is this section based on knowledge gaps across chapters, or is it limited to what you have addressed in chapter 1. Since this is a scene setting and framing chapter this could perhaps need coordination across chapters? It may be perceived as speaking for the whole report.	This is only based on our chapter. Each chapter has a knowledge gaps section, so we are concerned here with the high level issues which are underdeveloped.	Jan Fuglested	CICERO	Norway
78747	60	27			enormous knowledge gaps remain for highly renewable energy systems. Such solutions are consequently ignored by the IAM community, while hundreds of articles in that field exist in non-IAM research, as provided in the literature review.	Thank you for this detailed comment and literature suggestions. These issues are more relevant to chapters 2 and 6. I have passed this along to their authors.	Christian Breyer	LUT University	Finland
50483	60	33	60	35	The sentence citing Timmons Roberts et al 2020 does not spell out which gap this is about. Rather than	Thank you . We have expanded this to explain and highlight a little more.	Anne Marie Treguier	CNRS	France
54571	60	33	60	33	Clearly list these four agendas.	Thank you . We have expanded this to explain and highlight a little more.	Government of United States of America	U.S. Department of State	United States of America
80947	60	33	60	33	Missing full stop after "pandemic"	Thank you	Heinz Wittenbrink	FH Joanneum University of Austria	Austria
80517	60	35	60	35	Add to L35: Data analysis and modeling are still suffering from insufficient methodological investments ranging from groundbreaking concepts to innovative toolboxes to resolve interdisciplinary problems such as the ubiquitous 'scale problem' , i.e. the extreme variability of most components of the climate and urban systems. In other words, to resolve the scale dependency of most observables (Lovejoy and Schertzer, 2013, Schertzer and Tchiguirinskaia 2020)/	We now point to this issue a little more explicitly with the mention of new models, but this issue is more relevant to chapter 3 so I have passed this along.	Daniel Schertzer	Hydrology Meteorology and Earth System Science	France
12939	60	39	60	39	(e.g., Asheim et al. (2019), as (e.g., Asheim et al., 2019).	Thank you	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
22853	60	41	60	45	This might highlight the specific issue of what is meant by climate neutrality and how that impacts on biodiversity - and challenges also with other issues such as food security	Thank you	Government of France	Ministère de la Transition Écologique et Solidaire	France
45709	60	41	60	41	After "... declining biodiversity" please include a reference to the IPBES Global Assessment (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. S. Diaz, J. Settele, E. S. Brondizio E.S., H. T. Ngo, M. Guèze, J. Agard, A. Arneeth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L. A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, C. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (eds.), IPBES secretariat, Bonn, Germany. 56 pages. https://ipbes.net/sites/default/files/2020-02/ipbes_global_assessment_report_summary_for_policymakers_en.pdf	Thank you	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
50485	60	41	60	42	It would be better to mention explicitly which are these pressures, and cite specific chapters of SRCLL and SROCC. IS there a reference showing that agriculture-related options are under-researched?	Have added an example of a paper discussing these issues. Thank you	Anne Marie Treguier	CNRS	France
45711	60	43	60	44	You may also wish to consider that under its work programme up to 2030, the Intergovernmental Platform on Biodiversity and ecosystem services has requested the Executive Secretary of IPBES "to explore with the secretariat of the Intergovernmental Panel on Climate Change, possible joint activities on biodiversity and climate change, ..." (Decision IPBES-7/1: https://www.ipbes.net/sites/default/files/decision_ipbes-7_1_en.pdf)	Thank you	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
48667	60	44		45	ref to extensive literature on NBS, valuing nature and more specific practices such as payment for ecosystem services; for a summary see 'The Practical Fit of Concepts: Ecosystem Services and the Value of Nature' Global Environmental Politics, [early access online 22 December 2020, https://doi.org/10.1162/glep_a_00587] co-authors: Hayley Stevenson, Graeme Auld, Jen Iris Allan, Lorraine Elliott and James Meadowcroft	Thank you for the useful reference.	Lorraine Elliott	The Australian National University	Australia
50487	61	1	61	8	A few references would be useful here.	WE have added both cross references to IPBES and a couple of papers. Thank you	Anne Marie Treguier	CNRS	France
60443	61	3	61	3	To be coherent with the rest of the report, CCU should be added as well as CCS.	added	Célia Sapart	Université Libre de Bruxelles	Belgium
76303	61	3	61	3	CCU should be added as well as CCS.	added	Deepak PANT	Flemish Institute for Technological Research	Belgium
78799	61	3	61	3	You could add in the list of examples regarding strategic investments ; "CCU" for Carbon Capture and Utilization which represent all the strategies dedicated to substitute fossil based products or defossilize many industrial sectors (for energy, chemistry, materials) by CO2-based products. ref for chemistry sector: The Role of Carbon Capture and Utilization, Carbon Capture and Storage, and Biomass to Enable a Net-Zero-CO2 Emissions Chemical Industry, Paolo Gabrielli et al. ; Ind. Eng. Chem. Res. 2020, 59, 7033–7045	added a mention of CCU, though this isn't the place for a more extensive explanation. CCU and CCS are engaged with more directly later in the report and earlier in this chapter	Sylvain Nizou	CEA	France
83687	61	3	61	3	To be coherent with the rest of the report, CCU should be added as well as CCS.	Added	Christian Breyer	LUT University	Finland
54573	61	5	61	8	The Global Stocktake is to take stock of the implementation of the Paris Agreement to assess the collective progress towards achieving the purpose of the Agreement and its long-term goals. The outcome of the global stocktake shall inform Parties in updating and enhancing their NDCs, as well as in enhancing international cooperation for climate action. While, if successful, the GST would contribute to narrowing the emissions gap, it is not written thus in the text. It is important not to over interpret UNFCCC decisions, and the words "a gap supposed to be narrowed by the UNFCCC Global Stocktake" should be removed. It could be replaced with language to the effect of "... a process informed by the UNFCCC Global Stocktake --..."	Thank you, this has been modified	Government of United States of America	U.S. Department of State	United States of America

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14519	61	7	61	7	It's not the UNFCCC Global Stocktake, it's the Paris Agreement Global Stocktake.	Thank you	Joanna Depledge	Centre for Environment, Energy and Climate Change	United Kingdom (of Great Britain and Northern Ireland)
22855	61	9	61	9	In the section 1.10 presenting the road map of the report, it is really necessary to mention that the impact of the health crisis linked to covid-19 could not really be taken into account because of the timetable for the preparation of this report. We suggest to mention what this implies for the trajectories of chapter 3 and for the chapters as a whole.	This is a focus of the COVID box in this chapter, as well as receiving treatment throughout the report. Unfortunately the scope of this section is simply to lay out where different concepts are dealt with in the report, and we cannot repeat COVID framing here.	Government of France	Ministère de la Transition écologique et solidaire	France
54575	61	9	62	7	Move this section to the beginning of the chapter and add a summary of what Chapter 1 is attempting to accomplish.	We have decided to maintain this at the end of the chapter, as it leads into the rest of the report after the framing.	Government of United States of America	U.S. Department of State	United States of America
50489	61	31	61	31	Remove "in this section", because "Section" in AR6 refers to a part within a chapter.	accepted thank you	Anne Marie Treguier	CNRS	France
80195	61	40	61	41	The description of the cross-chapter box on SRM is not neutral. The ethics and governance of CDR or deep decarbonization are not described as "challenges", though both are central issues in any process of systemic change or just transition.	This does not refer to the cross chapter box on CDR, but to chapter 16 as a whole	Kelly Wanser	SilverLining	United States of America
80949	62	5	62	5	"This includes" instead of "This include"	thank you	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
45713	62	8	62	43	These three FAQ are extremely short. We suggest to further simplify the language and to provide some examples to illustrate the messages for lay persons.	Thank you	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
7909	62	10	62	18	1. GHG has been consistently used in the text, recommended to use GHG instead 2, recommended to refer to paper by Fawzy et. al (2020) https://doi.org/10.1007/s10311-020-01059-w , in which they have summarized the review on the mitigation of climate change.	Thank you, reference included and FAQ redrafted.	Cheng Yee Ng	Universiti Teknologi PETRONAS	Malaysia
45715	62	10	62	15	We note that the AR6 WG III report classifies CDR / negative emissions as a mitigation option. This generalization is not appropriate and not consistent with previous IPCC reports. While some approaches that remove CO2 from the atmosphere have been traditionally classified as mitigation, e.g. AF/RF, others, e.g. DAC, are fundamentally different. We strongly request the authors to maintain the differentiated classification as in previous reports and not to start mixing concepts. We kindly request to use the AR5- definition for CDR which provides enough differentiation to acknowledge overlaps yet avoid confusion. Please amend the report accordingly, including for example the definitions for mitigation and CDR in the glossary.	Although AR5 dealt with CDR separately to mitigation, and noted that the lines are blurred, AR6 treats issues of CDR and solar radiation management as mitigation options worthy of consideration. Therefore it is important in this FAQ to mention it as an option for consideration. Ch14 engages more deeply with these issues so we have cross referred for clarity.	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
50491	62	10	62	10	Unclear what is the difference between "action" and "activities". Perhaps regulatory measures should also be mentioned?	redrafted FAQ	Anne Marie Treguier	CNRS	France
9265	62	12	62	14	Is "inform" the right verb here? Or do you mean something like "support" or "advance" or "shape"?	redrafted FAQ	Maïke Nicolai	Helmholtz Centre Geesthacht	Germany
77187	62	12	62	14	The addition of "renewables" to the new and improved energy technologies whose implementation informs mitigation, excludes any other source - notably nuclear - that can play a significant role in reducing emissions.	redrafted FAQ to mention low carbon energy instead	Giacomo Grasso	ENEA	Italy
63207	62	14	62	15	FAQ 1.1: what is climate change mitigation? These lines refer to GHG removal from the atmosphere and GHG sinks. Since the vast majority of GHG removal is CO2 removal, we recommend these lines reflect that, in order not to misconstrue the state of science on GHG removal. Throughout the WGIII report, methods of CDR feature prominently in mitigation pathways, whereas there is no role for removal of other GHGs, since these are more speculative.	we have made this more specific thank you	Government of Canada	Environment and Climate Change Canada	Canada
83021	62	14	62	15	Since there are no anthropogenic removal options for gases beyond CO2 yet, better to refer to CO2 only and "carbon sinks" here	thank you, we have made this more specific	Geden Oliver	German Institute for International and Development Studies	Germany
9267	62	15	62	15	The shortened expression "greenhouse sinks" might be easily understood by climate scientists, but could perhaps confuse people with different backgrounds. Please add "gas" or paraphrase.	redrafted FAQ	Maïke Nicolai	Helmholtz Centre Geesthacht	Germany
46457	62	15	62	15	FAQ 1.1: It seems a bit late to PREVENT anthropogenic GHG-emissions to interfere with the climate system. Please rephrase: "...to interfere further..." or "to interfere in a dangerous manner".	thank you, we have redrafted the FAQ	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
9269	62	16	62	16	"Rate" might be understood as "speed" by many lay readers. In case this is not what you mean: Could the word be replaced, for example by "magnitude" or "extent"?	redrafted FAQ	Maïke Nicolai	Helmholtz Centre Geesthacht	Germany
50493	62	16	62	16	"reducing the rate of climate change" does not seem ambitious in view of the Paris Agreement, "halting global warming" (this chapter 1.1, page 6, line 12) and of the "net zero" objective.	redrafted FAQ	Anne Marie Treguier	CNRS	France
63209	62	16	62	17	FAQ 1.1: Recommend adding some additional examples to 'sources of emissions' besides land use change, which is far from the most important source of emissions - (i.e. add fossil fuel combustion related activities.)	We have added more examples thank you	Government of Canada	Environment and Climate Change Canada	Canada
46459	62	17	62	17	FAQ 1.1: why single out land-use change in such a manner? Please list a few more sources, or, alternatively, explain why you are stressing land-use change.	We have added more examples thank you	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
50495	62	18	62	18	Mitigation also requires understanding the mechanisms of carbon sinks.	Thank you, have included this	Anne Marie Treguier	CNRS	France
9271	62	19	62	33	I would suggest to rephrase the question according to the content of the answer - which seems to focus more on areas or sectors that cause greenhouse gas emissions (not so much on single activities).	Thank you, we have rephrased	Maïke Nicolai	Helmholtz Centre Geesthacht	Germany
50497	62	19	62	25	The concept of "CO2-equivalent" will need to be explained in simple terms in the FAQ. The emphasis on F-gases vs. nothing on methane seems surprising.	We have removed reference to this concept	Anne Marie Treguier	CNRS	France
50499	62	19	62	33	Is there research on the relative quantities of emissions directly linked with the end-user (like, driving one's car) vs. emissions made at the level of the industrial and other sectors? If there is, its conclusions could be interesting to include in this FAQ, for the public at large.	We have rephrased this away from focusing on individual activities and towards a higher level sector framing.	Anne Marie Treguier	CNRS	France
7911	62	20	62	33	1. the explanation did not exactly answer the question that is focusing on the human activities. other than the combustion of fossil fuels, GHG emissions can be also from industry, transportation, agriculture and even commercial and residential. Example information can be found from EPA website. https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data	The second paragraph of the FAQ explains specific activities rather than sectors. There will be combustion engines across industry, transport and residential sectors, and we mention that deforestation and agriculture are also sources of GHGs.	Cheng Yee Ng	Universiti Teknologi PETRONAS	Malaysia
63211	62	22	62	23	FAQ 1.2: Rather than only provide information on the contribution of CO2 and F-gases to total anthropogenic GHG emissions, this FAQ would be more informative if it also included the % contributions from FF-CO2, land-use-CO2, CH4 and N2O, consistent with figure SPM.2.	We have referred to the fuel combustion figure here (64%) to illustrate and referenced to SPM figure 2 for readers.	Government of Canada	Environment and Climate Change Canada	Canada
46461	62	23	62	25	FAQ 1.2: the elaboration about F-Gases seems a bit out of place - why deliver such detail only on F-gases? Please either delete or add similar information for the other gases as well.	Deleted	Government of Germany	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety	Germany
80951	62	23	62	23	The repeated "a few" is not precise. The numerical value would be better.	Deleted	Heinz Wittenbrink	FH Joanneum University of Applied Sciences	Austria
12941	62	25	62	25	(440%, (chapter 2)) as Chapter 2) also remove one extra bracket	Deleted	Amanullah Amanullah	Department of Agronomy, The University of Agriculture Faisalabad	Pakistan
22857	62	25	62	25	We recommend to specify what is 440% refers to in the sentence "They have also grown at the fastest rate for any 25 GHG (440%, (chapter 2)) and now contribute a few per cent in CO2 equivalents."	Deleted	Government of France	Ministère de la Transition écologique et solidaire	France
48169	62	26	62	33	The statement on the black carbon greenhouse effect is suggested to refer to IPCC AR6 WGI.	Added thank you	Yang Wang	Beijing Climate Center	China
60161	62	26	62	33	additional emissions from groundwater extraction as well	This would fall under "land related activities". though thank you for the suggestion.	Government of Hungary	Ministry of Innovation and Technology	Hungary

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12943	62	31	62	31	(2). In addition remove one extra dot	Thank you	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
9273	62	34	62	34	Lay readers might not know what you mean by "similar terms" here. Could this vague reference be omitted from the question or a summarising expression be found? It might also be useful to refer to a concept (as done in the answer) instead of a "term". On the other hand, I wonder how useful an FAQ is that repeats language of the Paris Agreement and then refers to the Glossary for explanations. I would suggest to either really explain the concept of net-zero emissions in the FAQ itself or leave out this FAQ completely. The chapter 3 FAQs might capture these aspects well enough.	We have reframed this to compare net zero and carbon neutrality in order to highlight consumption vs territorial emissions calculations. Thank you for raising this.	Maïke Nicolai	Helmholtz Centre Geesthacht	Germany
63213	62	34	62	42	FAQ 1.3: What do net zero emissions mean...? - Given that the terms net zero carbon emissions (carbon neutrality) and net zero GHG emissions are both used extensively in the WGIII report and feature in the SPM, this FAQ would be more useful if it familiarized readers with the meaning of these two terms and how they are related. As currently written, readers could come away with the impression that the terms are synonymous.	Thank you, FAQ redrafted.	Government of Canada	Environment and Climate Cha	Canada
81143	62	34	62	42	This FAQ fails in my view to provide the necessary clarity on the different roles of net-zero GHGs vs net-zero CO2, and gives the impression that the 'balance' goal in Article 4 applies to long-lived gases only. It thus does not sufficiently clarify net-zero emissions as relevant to the Paris Agreement, nor does it provide clarity on the important nuances and differences in temperature outcomes between net-zero long-lived gases and net-zero all gases. In addition, 'climate neutrality' is deliberately not defined in the IPCC glossary as it is considered an ill-defined concept with too many too diverse interpretations, but the FAQ implies that it is indeed defined, discussed, and useful. Please ensure this box is factually correct and fully reflects the important aspects that relate to net-zero emissions, using WGI Box 1.4, the glossary definitions, and the potential FGD box on net-zero in WGIII chapter 3 as a resource. Please engage with authors involved in those boxes when you revise this draft (and ideally request their input as co-authors) - it would be rather problematic if an FAQ on net-zero in chapter 1 ends up being inconsistent with the assessment of net-zero in other chapters of this report and in other IPCC reports (WGI).	The FAQ has been significantly redrafted in light of these comments.	Andy Reisinger	Ministry for the Environment	New Zealand
7913	62	36	62	42	The idea is pretty simple that the overall balance between GHG emissions produced and take out of the atmosphere. However, the explanation here did not really addresses it. The climate council of Australia and world resources institute explained that very well, perhaps this can be referred and cited. https://www.climatecouncil.org.au/resources/what-does-net-zero-emissions-mean/ https://www.wri.org/blog/2019/09/what-does-net-zero-emissions-mean-6-common-questions-answered Example can also be included e.g., initiatives by companies and academic R&D https://www.petrnas.com/sustainability/net-zero-carbon-emissions https://doi.org/10.1016/j.buildenv.2021.107619	This FAQ has been expanded and reframed in light of the resources you have sent and additional internal conversations. Thank you.	Cheng Yee Ng	Universiti Teknologi PETRON	Malaysia
80953	62	36	62	36	"long-living" instead of "long-lived" (?)	rejected	Heinz Wittenbrink	FH Joanneum University of A	Austria
30527	62	40	62	42	We support updated definitions of carbon neutrality and greenhouse gas neutrality as well as net zero CO2/greenhouse gas emissions in Glossary. These would be useful for clarification of political targets featuring these terms. However, we notice that the entry of climate neutrality is missing. This term should be included, as in SR15 Glossary.	Carbon neutrality is now in the glossary, and we have expanded this FAQ to discuss the term more explicitly.	Government of Japan	Climate Change Division - M	Japan
84141	62	42	62	42	FAQ 1.3: This comment only on the long-lived gases. This needs some statement that stabilisation (or 0.3%/yr decrease) in SLCF forcing is sufficient to hold global temperature increases below a given level.	We have substantially rewritten this FAQ. Thank you for raising this point	William Collins	University of Reading	United Kingdom (of Great Britain and Northern Ireland)
12945	63	1	99	12	Better to correct all references according to one standard style of IPCC	Thank you, we have carefully checked the references in light of these comments	Amanullah Amanullah	Department of Agronomy, TH	Pakistan
65587	63	2	99	12	Standardized the use and citation of references.	Thank you, we have carefully checked the references in light of these comments	Mônica M. C. Muelbert	UNIFESP	Brazil
85619	63	2	98	18	First author name is missing. There are many other references missing the first author.	Thank you, we have carefully checked the references in light of these comments	San Win	Environmental Conservation	Myanmar
79889	65	1	65	10	Highlights the progress made on the implementation of ICTU decision 4/CMA.1. Further guidance in relation to the mitigation section of decision 1/CP.21. (COP24 rule book) on NDCs and the advantage of having systematic collection of data (e.g. on Mitigation/Adaptation Co-benefits) under ICTU for scientific future research on NDCs. Also add a line on the intended purpose of the UNFCCC Global Stocktake - line 7..	This doesn't seem to fit this section	Carlos Ruiz Garvia	UNFCCC	Panama
79891	65	1	65	10	In connection with the above, progress on implementation of the Enhance Transparency Framework is expected to have a positive trend in producing and gauging data on implementation of NDCs.	This doesn't seem to fit this section	Carlos Ruiz Garvia	UNFCCC	Panama
61085	70	9	70	9	Full reference missing for "Dubash, N. K., Varieties of Climate Governance. Env. Polit.,"	Thank you, we have carefully checked the references in light of these comments	LOKESH CHANDRA DUBE	TERI School of Advanced Stud	India
84537	70	21	70	22	Please insert the following reference: "Edvardsson Björnberg, K., Karlsson, M., Gilek, M. and Hansson SO. (2017) Climate and Environmental Science Denial. A review of the scientific literature published in 1990–2015. Journal of Cleaner Production 167, 229-241. https://doi.org/10.1016/j.jclepro.2017.08.066 ."	Thank you, we have carefully checked the references in light of these comments	Mikael Karlsson	KTH Royal Institute of Techn	Sweden
84539	80	4	80	5	Please insert the following reference: "Karlsson, M., Gilek, M. (2019) Mind the gap: Coping with delay in environmental governance. Ambio 49, 1067–1075 (2020). https://doi.org/10.1007/s13280-019-01265-z ."	Thank you, we have carefully checked the references in light of these comments	Mikael Karlsson	KTH Royal Institute of Techn	Sweden
76589	81	9	81	10	The chapter is ill-served by the reference to this study, whose conclusion on nuclear costs are at odds with the literature on the subject and whose scope seems to be local, since the abstract suggest that "In a strategy to eliminate all non-CCS coal power stations, some 1600 MW of nuclear power would be required and sufficient to cover the base load for the electrical energy supply system".	we use this as an example of literature highlighting some potential for nuclear energy. For greater detail, we refer forwards to chapter 6 on energy systems, where there is a deeper engagement with these issues.	Charlotte MIJEON	Réseau "Sortir du nucléaire"	France
80519	83	13	83	13	Add after L13: Lovejoy, S., Schertzer, D. (2013). The weather and climate: Emergent laws and multifractal cascades, Cambridge University Press. 512 p.	Thank you, we have carefully checked the references in light of these comments	Daniel Schertzer	Hydrology Meteorology and	France
80521	88	15	88	15	Add after L15:Palmer, T., Williams, P., eds., (2009). Stochastic Physics and Climate Modelling, Cambridge University Press, Cambridge 496 p.	Thank you, we have carefully checked the references in light of these comments	Daniel Schertzer	Hydrology Meteorology and	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
4875	92	13	92	14	The Reference should be: Saunders, H., Roy, J., Azevedo, I. Chakravarty, D. Dasgupta, S., de la rue du Can, S., Druckman, A., Fouquet, R., Grubb, M., Lin, B.Q., Lowe, R., Madlener, R., McCoy, D., Mundaca, L., Oreszczyn, T., Sorrell, S., Stern, D., Tanaka, K., Wei, T., 2021: Energy Efficiency: What has it Delivered in the Last 40 years? <i>Ann. Rev. Environment and Resources</i> (submitted). Working paper: https://www.fcen.eonerc.rwth-aachen.de/cms/E-ON-ERC-FCN/Forschung/emv/Arbeitspapiere/lidk/1/	Thank you, we have carefully checked the references in light of these comments	Harry Saunders	Carnegie Institution for Science	United States of America
80523	92	20	92	20	Add after L20: Schertzer, D., Tchiguirinskaia, I. (2020). A century of turbulent cascades and the emergence of multifractal operators. <i>Earth Sp. Sci.</i> 7 e2019EA000608. doi.: 10.1029/2019EA000608	Thank you, we have carefully checked the references in light of these comments	Daniel Schertzer	Hydrology Meteorology and Climatology	France
80525	96	16	96	16	Add after L16: Vicari, R., Tchiguirinskaia, I., Schertzer, D. (2019a). Assessing the impact of outreach strategies in cities coping with climate risks <i>Geosci. Commun.</i> 2, 25–38, 2019 doi:10.5194/gc-2-25-2019.	Thank you, we have carefully checked the references in light of these comments	Daniel Schertzer	Hydrology Meteorology and Climatology	France
80527	96	16	96	16	Add after L16: Vicari, R., Tchiguirinskaia, I., Tisseriesand, B., Schertzer, D. (2019b). Climate risks, digital media, and big data: following communication trails to investigate urban communities' resilience. <i>Nat. Hazards Earth Syst. Sci.</i> , 19, 1485–1498. doi: 10.5194/nhess-19-1485-2019.	Thank you, we have carefully checked the references in light of these comments	Daniel Schertzer	Hydrology Meteorology and Climatology	France