

IPCC AR6 WGIII - First Order Draft Review Comments and Responses - Chapter 4

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
10827	0	0	0	0	There are so many citations of literatures by the CLA of this Chapter. I found more than 30. I guess this is because he is quite active in this field. Still it better to search as many other literatures from broad scientific community.	Accepted - Text revised - Least relevant citations from CLAs to be removed	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan
10829	0	0	0	0	This chapter mainly discusses how to fill the gap between short-term NDCs and long-term Paris goals of 2 and 1.5 degrees. This is critical point indeed. To do this, however, important point we never miss is why such a huge gap has occurred. In other words, global emissions continue to increase and never peaked out despite the fact that UNFCCC, the Kyoto Protocol and the Paris Agreement have took effect. Without exploring this point, it will not be persuasive if this assessment report suggest how do we shift to achieve ultimate goals. In general this chapter is rather weak in assessing economic aspect of mitigation in comparison to the assessment of other aspect such as equity, fairness etc. For example, there are no information on impact of mitigation to GDP (GDP loss) and Marginal Abatement Cost to implement NDCs (and competitiveness/border carbon adjustment). In this sense, this chapter is not fully policy relevant for policymakers, the targeted readers of this report. There are literatures discussing these points: Aldy et al. "Economic tools to promote transparency and comparability in the Paris Agreement", Nature Climate Change (2016), Akimoto et al. "The analyses on the nationally determined contributions and the expeted global emission pathways" Evolut Inst Econ Rev 2016. Please addeconomic flavour by refering to those literatures.	This is a 2-part comment. Part 1 Rejected. Drivers of past emissions are out of scope of Ch4, and are discussed in Ch2. Part 2 Taken into account. Economic aspects of mitigation already assessed in 4.3.3, and to be expanded in SOD. Proposed references to be assessed.	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan
12921	0	0	0	0	The Chapter title is "Mitigation and development pathways in the near- to mid-term". However, the chapter only discusses (GHG) emission pathways. All the sectors like energy , transport and trade are also discussed only with reference to GHG emission. There are other mitigation pathways for climate change and sustainable development!	Rejected. Development pathways discussed in section 4.3. Sector-specific pathways discussed in relevant sectoral chapters.	Prashant Goswami	Institute of Frontier Science and Application	India
16069	0	0	0	0	This is a really good draft. It covers short/medium term models well, reviews NDC literature and also introduces conceptual ideas - development pathways and accelerating mitigation - in a convincing way. I particularly like 4.4 on shifting development pathways because it roots the chapter in real things governments can consider. One way of expanding that range is to scour the WG for other examples in other chapters you could cross reference here, so that the reader gets a sense of a broader set of approaches beyond those you have picked as examples and for which you have space. There are a lot of connections to CH 13, which both chapters could cross ref. which I point to in the detailed comments. The development pathways discussion is promising, and could be refined based on the on-going conversation across chapters. I think you could possibly use the "multiple objective" framing and synergies/trade-offs language (which is used by CH 1) a bit more in operationalising linkages between development pathways and accelerating mitigation.	Accepted - Text revised. Will explore connections to other chapters in FOD, and introduce "multi-objective" language.	Navroz Dubash	Centre for Polcy Research	India
33163	0		6		Good	Thank you	Edris Alam	Rabdan Acadmey	United Arab Emirates
3207	0				It is a pity that the executive summary of this chapter has not been included in this draft report. The concept of this chapter is very interesting and new for the assessment reports of the IPCC and is very much supported. It is expected that once the excecutive summary is available a better alignment among the chapters (e.g. chapter 3 and 4) will be achieved.	Accepted - Executive Summary to be added in SOD	Klaus Radunsky	retired from Umweltbundesamt	Austria
10963	0				The topic of net zero emission buildings requires more attention and careful considerations. Several net zero emission buildings are achieved by including emission credits quantified as potentially avoided grid mix electricity production of an amount of electricity equivalent to the amount of electricity exported. This however leads to the situation that the electricity exported shows the GHG intensity of grid mix. Please consider the following table to classify the different zero emission building definitions (with increasing level of : - A balance approach: A2.1 attributing the potential benefits caused by exported energy to the GHG emissions of the building; A2.2: attributing the pro rata share of GHG emissions caused by on site energy production to the exported energy; amount of exported energy and potential benefits caused by exported energy reported as additional information - B economical compensation: purchasing GHG emission certificates - C technical reduction: investing in negative emission technologies (biological fixation, biogenic energy resources with carbon capture and storage, direct air capture with CO2 separation and storage) or purchasing their negative emissions - D absolute zero: using construction materials with real zero GHG emission footprints. Zero emission building terms and definitions: - Zero emission building: life cycle based, absolute zero (Option D) - Net zero emission building, by responsibility: life cycle based, combined with technical reduction (Option C) - Net zero emission building, by compensation: life cycle based, combined with economical compensation (Option B) - Net zero emission building, by credits: life cycle based, including potential benefits beyond the system boundary (Option A2a) - Zero operational emission building: operational GHG emissions only (Option D, operational only) - Net zero operational emission building: operational GHG emissions only, combined with technical reduction (Option C, operational only) - Net zero embodied emissions building: embodied GHG emissions only, combined with technical reduction (Option C, embodied only)	Rejected. Beyond the scope of Ch4. This is an issue for Ch9 (buildings).	Rolf Frischknecht	treeze Ltd.	Switzerland

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16241	0				In Chapter 4: Mitigation and development pathways in the near- to mid-term, consider including a description of the climate impact of planned space development, for the sake of clarity and accuracy. Launches to space can create significant GHG emissions.	Rejected. Not supported by peer-reviewed literature. We have not found literature that would evaluate the potential emissions associated with space travel.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
16243	0				In Chapter 4: Mitigation and development pathways in the near- to mid-term, consider including a treatment of military policies and how they drive climate change, for the sake of accuracy and clarity.	Rejected. Drivers of emissions are outside of the scope of Ch4. They are discussed in Ch2.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
16245	0				In Chapter 4: Mitigation and development pathways in the near- to mid-term, consider including a treatment of how recent trends in new countries adopting nuclear power increases the risk of nuclear arms proliferation. See, for example, Goldemberg, J., 2009. Nuclear energy in developing countries. Daedalus, 138(4): 71-80. Notably missing from plans for adopting nuclear power in a widespread fashion to address climate change is a new international mechanism that would identify the most nuclear-arms-proliferation-resistant pathway and require that this pathway be followed. The current Non-Proliferation Treaty was not adopted to address climate change, and its utility is not up to the task. For example, Saudi Arabia is presently developing facilities for nuclear materials enrichment to fuel its planned new nuclear power program, and this may be a pretext for nuclear arms production.	Taken into account. Developments in nuclear power discussed in 4.2.5. Risks associated with nuclear power development out of scope of Ch4, to be discussed in Ch6 (energy systems)	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
16753	0				Equity is a central element of the UNFCCC and Paris Agreement architecture. Equity is also essential for the achievement of the Paris Agreement temperature goals. The assessment of mitigation in the national context therefore needs to include an extensive equity component. The draft report touches upon the topic of equity and fairness in relation to mitigation ambition of individual countries in several subchapters (1.4.6 , 4.2.2.5, 4.4.4, 14.4.2.3.), but currently this assessment is insufficient. The report refers to the scientific literature that provides frameworks assessing the fairness and equity of countries mitigation levels (4-15 line 38; 4-70, line 5; 14-20, line 37) but does not provide any assessment of the results of that literature. It is essential that the next draft of the report provide this assessment. Such assessments are available in the scientific literature, i.e. from Robiou du Pont et al. (2017), Winkler et al 2018, or Climate Action Tracker 2018).	Rejected. This comment is about equity across the WG3 report. We can respond on chapter 4, in which we have a section on "equity, including just transition" (as noted by comment). This section assesses the references provided, and others beyond that.	Dennis van Berkel	Urgenda	Netherlands
16755	0				[continued] The following will firstly address the elements that should be reflected in the results of this assessment. After this, further comments will follow on why this assessment needs to be included in the AR6 report. The results of the assessment should include the following: <ul style="list-style-type: none"> •The emission reduction ranges should be provided for 2030 and 2050. In connection to this the individual carbon budget ranges for these countries should be provided, in order to provide countries with policy option to vary the timing of their emission reductions while staying within the emission limits that are necessary to stay below the Paris long-term target. •The report should identify fair and equitable emission reduction ranges per country that are in line with holding global warming "well below 2C" and "1.5 C". Due to the reported ambiguities with regards to the interpretation of the long-term temperature goal of the Paris Agreement (as discussed at 3-11 line 19), the report should also provide results for a higher likelihood than 66% chance of holding warming below 2C. 	This is a 2-part comment. Part 1 taken into account. Comparison between sum of mid-century strategies and LT emissions pathways in 2050 to be considered, literature permitting. Part 2 rejected. Out of scope of this report. The IPCC does not assess individual country targets, since this would be policy prescriptive.	Dennis van Berkel	Urgenda	Netherlands
16757	0				[continued] •The results should make a clear distinction between effort sharing methods that are based on international law principles (particularly CBDR-RC and the precautionary principle) and methods that reflect countries practices. In connection with this the individual ranges should be provided such that if all countries reduce at the bottom of their range, that the Paris temperature target would still be in reach. Ranges that would not be in line which this would run counter to the international law principles. <ul style="list-style-type: none"> •Specifically, there is a suggestion to include a table in the Annex to Chapter 4 that provides such ranges for all countries linked to either section 4.2.2.5 or 4.4.4. 	Rejected. Out of scope of this report. The IPCC does not assess individual country targets, since this would be policy prescriptive.	Dennis van Berkel	Urgenda	Netherlands
16759	0				[continued] The following will describe the reasons for including the assessment as outlined above in the AR6 report. The importance of equity for achieving the Paris Agreement long term target is emphasised throughout the report. At 4-69, line 41, it is noted that equity is an "instrumentally an enabler of deeper ambition for accelerated mitigation". At 4-70, line 12, it is noted that: "the literature suggests a relationship between the effectiveness of cooperative action and the perception of fairness of such arrangements". Similar findings are reported in the context of chapter 14. At 14-13, line 28 it is noted that equity is of central importance to the climate debate, and hence for evaluating the effect of policies. This is also evidenced by the fact that that equity is repeatedly referenced in the UNFCCC, the Paris Agreement and the Paris Rulebook. AR5 also reported on the importance of equity in national mitigation levels: WG III, Chapter 3, p. 213 (Executive Summary), WG III, Chapter 4, p. 287 (Executive Summary), p. 295 and p. 327 (Frequently Asked Questions 4.4).	Noted. See answer to comment #16755.	Dennis van Berkel	Urgenda	Netherlands

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16761	0				[continued] Results on equitable mitigation levels for individual countries are therefore essential to enable different actors within countries to assess their countries ambition level. Governments need parameters to be able to assess their own performances and ambitions against equity standards, but these standards are equally important for all other actors that actively pursue an equitable contribution from their country to the global reduction efforts. These actors range from parliamentarians, to NGO's to citizens groups. The draft report specifically notes the new role of citizens engagement in increasing countries ambitions and the role of science in enabling this citizens engagement. (chapter 13.9.2). The IPCC AR6 report should therefore include results on the assessment of fairness and equity of countries mitigation levels in its report, along the lines set out in the above.	Noted. See answer to comment #16755.	Dennis van Berkel	Urgenda	Netherlands
16763	0				[continued] Courts are also increasingly looking at scientific results on the equity of countries' mitigation levels. This is mainly done in the context of cases where it is argued that insufficient mitigation levels of individual countries constitute a violation human rights and constitutional rights which create obligations in the domestic legal order. The most prominent of these cases is the so called Urgenda case, in which the Dutch Supreme Court ruled on 20 December 2019 in highest and last instance. (See: https://www.ejiltalk.org/a-new-classic-in-climate-change-litigation-the-dutch-supreme-court-decision-in-the-urgenda-case/).	Noted. See answer to comment #16755. Literature on litigation is out of scope of Ch4, and is assessed in Ch13.	Dennis van Berkel	Urgenda	Netherlands
16765	0				[continued] The Dutch Supreme Court ruled that based on human right law, the Netherlands has a duty to do its "fair share" of the global emission reductions. In this context the court specifically pointed at the Paris Agreement, the CBDR-RC principles and the precautionary principle. In determining the minimum level of reduction that would be in line with its human rights obligations the court amongst others looked at the effort sharing results published in previous IPCC reports. For this reasons assessment of effort sharing of mitigation levels of the IPCC in AR6 should make a clear distinction between effort sharing methods that are based on international law principles (particularly CBDR-RC and the precautionary principle) and methods that reflect countries' practices. (On the use of science in the Urgenda decision see. http://www.lse.ac.uk/GranthamInstitute/news/urgenda-v-state-of-the-netherlands-lessons-for-international-law-and-climate-change-litigants/).	Rejected. Beyond the scope of this report. The role of the IPCC is not to provide basis for litigation, nor to interpret international law.	Dennis van Berkel	Urgenda	Netherlands
16767	0				[continued] The Urgenda case is by no means unique. Similar cases have been filed in a range of countries around the world, particularly in the developed world, and other courts are also finding binding obligations in the domestic legal order with regards to national emission reductions. Two very recent examples are judgement of a German administrative court (31 October 2019) and a Norwegian court of appeal (23 January 2020). In both cases the courts found that the constitutions of the respective countries created binding obligations with regards to the reduction of emissions from their own territory. In both cases the courts looked at science, particularly as reported by the IPCC, to inform the scope of the obligations in the particular circumstances.	Noted. See answer to comment #16755.	Dennis van Berkel	Urgenda	Netherlands
16769	0				[continued] These cases are part of a fast growing body of caselaw. Court in the future will continue to look for scientific assessments of equitable effort sharing. It is therefore important that the IPCC includes results of the assessment of proposed frameworks that assess the fairness of national mitigation levels, and that these are reported along the lines that were described above.	Noted. See answer to comment #16755.	Dennis van Berkel	Urgenda	Netherlands
16771	0				The Chapter should include more analysis of the costs and risks associated with individual countries delaying emissions reductions in the short-term. Governments routinely argue that delays in the short term can be compensated by increased ambitions in the future. Science can provide a better understanding at the level of individual countries what the consequences and limitations of such delays are. It would be helpful if part of that analysis addresses the limits to the pace of emission reductions. Emission pathways described in Chapter 3 look at 'cost effectiveness' trajectories. They provide limited information however, at least in the way that they are reported, on the consequences of not following these pathways on an individual country level. Relevant aspects that need to be reported on are both the technical and societal limits to the pace of emission reductions. Specifically, Section 4.4 should assess such implications in greater detail including with regards to delayed action in the context of equity and in the context of risks for stranded assets.	Accepted. Section 4.4.3 will provide more information on the risks associated with delaying emissions, in coordination with Ch3, section 3.5.	Dennis van Berkel	Urgenda	Netherlands
28215	0				The SLoCaT Partnership has established a database of 445 studies on mitigation potential in the transport sector https://slocat.net/trakb/ . For analysis see http://ppmc-transport.org/wp-content/uploads/2015/08/Emission-Reduction-Potential-in-the-Transport-Sector-by-2030.pdf	Rejected. Outside the scope of this Chapter. Transport-specific initiatives are dealt with in Ch10 (transport).	Cornie Huizenga	CESG	Germany
41297	0				The concepts net zero, carbon neutrality, GHG balance are used throughout the chapter. A clarification of definitions in the start of the chapter would be useful. Relevant papers here are Rogelj et al. ERL 2015; and Fuglestad J, Rogelj J, Millar RJ, Allen M, Boucher O, Cain M, Forster PM, Kriegler E, Shindell D. 2018 Implications of possible interpretations of 'greenhouse gas balance' in the Paris Agreement. Phil. Trans. R. Soc. A 376: 20160445. http://dx.doi.org/10.1098/rsta.2016.0445	Out of scope. Definition of net zero, carbon neutrality and GHG balance are being developed for the WGIII report as a whole, and there will be glossary entries.	Jan Fuglestad	CICERO	Norway
41299	0				The chapter addresses the role of SLCF in near term mitigation strategies. For consistency across reports in AR6, please consider material in WGI chapter 6 Short-lived climate forcers.	Accepted. Reference to WG1 Ch6 will be made when discussing short lived climate forcers.	Jan Fuglestad	CICERO	Norway

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41301	0				As far as I can see, not much attention is given to international aviation and shipping. I suggest you try to include these sectors - coordinated with ch3 and in particular ch10.	Accepted. Text revised.	Jan Fuglestedt	CICERO	Norway
41303	0				Restricted by what is used in the literature and NDCs, the chapter use the unit CO2eq to a large extent. I suggest you as much as possible give info for the individual gases - due to their very different physical behaviours and differences in sources and mitigation options. In the cases where you still use CO2eq you need to say which gases are included and which GWPs are used.	Rejected. IPCC bureau gave Ch4 mandate to use CO2eq and disaggregate literature permitting. As noted in the comment, this is usually not the case.	Jan Fuglestedt	CICERO	Norway
41305	0				Committed warming due to infra structure is treated in ch2 but could also be covered in ch4. Please clarify with ch2 who does what and secure consistency	Taken into account. Committed warming to be included in SOD.	Jan Fuglestedt	CICERO	Norway
41319	0				Potentially relevant paper: Guidance on emissions metrics for nationally determined contributions under the Paris Agreement; by Steve Denison et al 2019 Environ. Res. Lett. 14 124002.	Rejected. Outside of scope of Ch4. Metrics are discussed in Ch3 and in WG1.	Jan Fuglestedt	CICERO	Norway
46727	0				Co-benefits are not adequately addressed in the chapter, considering their important role for near- to mid-term mitigation. Please see further in the major review Mikael Karlsson, Eva Alfredsson & Nils Westling (2020) Climate policy co-benefits: a review, Climate Policy, DOI: 10.1080/14693062.2020.1724070.	Accepted [other comment]. Section 4.3 discusses articulation between mitigation and other development objectives, which is broader than the cobenefits language.	Mikael Karlsson	KTH Royal Institute of Technology	Sweden
6171	1	22	1	25	consider also underexploited opportunities to engender the shift - this could be fused as a separate question, or into their third question	Comment lacking concrete examples of 'underexploited opportunities to engender the shift'	Jude Ndzifon Kimengi	Department of Geography and Environmental Studies, Catholic University of Cameroon (CATUC)	Cameroon
22339	1	1	16	23	This is a very well written Executive summary and subsequent sections	Thank you	Alfred Ofosu Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana
15777	1	1	77	20	The chapter should emphasize the available short and mid term mitigation strategies and climate actions (up to year 2050) with research about their impacts, pros and cons, so that the impact of each possible climate action is depicted with information for executive action. Mitigation strategies and possible actions are mainly described in table 4.5, but I feel that the list should be the center of the chapter. Focusing on the the available mitigation strategies and their projected impact with purpose of generating more awareness on what is needed to fully address climate change, Climate Interactive has published a new simulator, EN ROADS, available at https://www.climateinteractive.org/tools/en-roads/ , with a list of key possible available mitigation strategies and climate actions that show in real time the projected temperatures created by applying mitigation strategies the climate actions in a worldwide scale. Here is a link to their latest article, Rooney-Varga, J. N., Kapmeier, F., Sterman, J. D., Jones, A. P., Putko, M., Rath, K., The Climate Action Simulator, Simulation & Gaming, https://journals.sagepub.com/doi/full/10.1177/1046878119890643 A word of caution: this EN ROADS simulator is not an IAM, it is just an easy to use simulator for general public use in order to foster and to create more awareness on possible mitigation strategies that could lead to a 1.5 scenario. For example, it has been used by politicians, media, students, and public in general, as stated in Climate Interactive's page "A wide range of people have used En-ROADS, including members of the U.S. Congress, HSBC bank, the Hewlett Foundation, local community groups, the UN Secretary-General's Office, university professors around the world, leading science educator Bill Nye, and many others." at: https://www.climateinteractive.org/tools/en-roads/	This is a 2 part comment. Part 1. Taken into account. We will consider ways to make mitigation strategies in 4.2.5 easier to grasp. Part 2. Rejected. It is beyond the scope of the report to assess awareness-raising tools.	EDUARDO PEDRO FRACASSI	ITBA Instituto Tecnologico de Buenos Aires	Argentina
14713	1			77	The FOD provides a useful structure and insights of the chosen direction. However, the chapter is currently falling critically short from providing an assessment in which the authors assess the evidence (its quality, strengths and limitations) and put this in context of the agreement that is found in the literature to express a level of confidence about the findings described in the chapter (using calibrated IPCC language). The current chapter text provides a good overview, but stops at the descriptive level by simply listing various studies without deeper assessment of their scientific value and robustness. Unless there has been an explicit decision by the IPCC leadership to break with the IPCC's practice of providing a traceable confidence assessment for all its statements, this is a key improvement to be implemented during the writing of the SOD in order to bring this chapter to the level expected from an IPCC assessment.	Accepted. Text revised.	Joeri Rogelj	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
27717	1	1	87	70	Thanks for this most instructive and well-constructed chapter.	Thank you	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
27719	1	1	87	70	The chapter needs a fair amount of editing in its first half, and could be enriched by additional substance in the second half.	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
27721	1	1	87	70	It is unclear why the development paths path should be introduced separately from other paths, trajectories, scenarios The presentation of development paths throughout the chapter is a bit pedestrian. The explanations are too long for the content and by trying to be overly pedagogic they become confusing. The concept is not that complicated or different from any other in this context and does not, in my opinion, merit long digressions. On the other hand, it might profit of being better integrated in the general discourse.	Rejected. "Development pathways" are part of Ch4 title and should thus be defined separately. However, the comment is taken into account to the extent that there is a glossary entry on "development pathways", following on discussions across chapters	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
28627	1	1	100	50	Thank you for the very easy to read and educational chapter.	Thank you	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNVIERSITY	Canada
20277	1			127	Only cursory mentions of waste (1 Waste disposal and 3 Waste to energy) for mitigation in terms of waste reduction / resource efficiency/ circular economy they represent significant pathways that is linked to human activity. Would be happy to write about 300 to 500 words on this issue to set up the detail in Chapter 5. Let me know	Rejected. Outside of scope of Ch4. Waste management to be dealt with in Ch5 (behavior), Ch6 (energy) and Ch8 (cities).	Paul Dumble	Paul's Environmt Lentd	United Kingdom (of Great Britain and Northern Ireland)

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43693	1	1			The focus on just transitions and shifting development pathways is well taken. It would great if development pathways could also be specified in terms of wellbeing and decent living standards in coordination with Chapter 5.	Accepted. Text revised.	Felix Creutzig	MCC Berlin	Germany
43697	1	1			Chapter 3 is doing long-term scenarios and does not reflect current technological development in detail. Chapter 4 is focussing on NDCs and development pathways. Which chapter is responsible for reflecting current technological developments, and juxtaposing insights to Chapter 3?	Noted. Ch4 includes a section on innovation as an enabling condition (in 4.4.2).	Felix Creutzig	MCC Berlin	Germany
1775	2	6	2	6	Reframe head	Accepted. Subheading to be shortened.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1777	2	8	2	8	Reframe head	Rejected. Not clear what direction section heading should be rephrased.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1779	2	10	2	10	Add relevant National Reports	Rejected. Content of section 4.2.1 is about NDCs	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1781	2	11	2	11	Add sub-heads based on Sectors and Major Aspects	Rejected. Outside of scope of Ch4. Sector-specific issues are dealt with in Ch6-11	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1783	2	14	2	15	should have specific sub-heads of Regions	Rejected. A limited number of mid-century strategies have been submitted so far, so there is not enough material to have regional subheadings here.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1785	2	16	2	16	Reframe pt. 4.2.5 as "Actions to accelerate mitigation"	Noted. All headings and subheadings to be revised to highlight chapter storyline.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1787	2	22	2	22	Reframe: Measures to shift development Pathways and pace & Scale of mitigation	Noted. All headings and subheadings to be revised to highlight chapter storyline.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1789	2	23	2	23	Ways to shift development Pathways	Rejected. Unclear proposal for revised heading.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1791	2	25	2	25	Add " and other Externalities"	Rejected. "other externalities" relate to co-benefits/adverse side effects of mitigation, which are dealt with in section 4.3.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1793	2	28	2	28	substitute " can build" with building	Noted. All headings and subheadings to be revised to highlight chapter storyline.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1795	2	30	2	30	Add Sectoral sub-heads	Rejected. This is outside of the scope of Ch4. Sectoral chapters (Ch6-11) deal with adaptation.	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
1797	2	33	2	33	Add reference "Orchestrating Sustainable Urban Development: Final Report of the SASUI Project , Minna Santaoja , Aalto University Publication series , 2016	Rejected. Cannot add reference in Table of Content. According to title, reference relevant to Ch8 (urban systems)	Alka Bharat	Department of Architecture & Planning, M.A.National Institute of Technology (An Institute of National Importance),Bhopal (M.P.)	India
45567	4	1	4	1	A definition of a development pathway and examples of these should be given here. This is provided later on but needs to be moved to the intro	Accepted. Development pathways to be defined earlier	Daniel Crow	International Energy Agency	France
17863	4	5	4	5	the word 'Assessment' better not start with the capital letter	Editorial – copyedit to be completed prior to publication	Christy Cecilia Veronica Suhendy	Pattimura University	Indonesia
41411	4	9	4	10	The Nakicenovic et al. 2000 reference is not in the reference list. Also, please indicate whether it was an IPCC Special Report or a Special Report of other organization.	Accepted. Reference to be included in reference list.	Cheah Singfoong	Independent consultant, formerly more than 10 years with the National Renewable Energy Laboratory, USA	United States of America

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46381	4	20	4	20	Explain economic nationalism	Rejected. This term is used in public discourse, and is listed along with others. If each of these were explained, it would change from a bracket given a sense to several paragraphs	Henrik Carlsen	Stockholm Environment Institute	Sweden
15775	4	22	4	25	Question 3 on line 24, "how do we shift there?" does not seem to be answered in the rest of the text.	Rejected. The title of Section 4.1 is precisely "how to shift development pathways and accelerate mitigation".	EDUARDO PEDRO FRACASSI	ITBA Instituto Tecnológico de Buenos Aires	Argentina
41413	4	23	4	24	For question (2), are "what do we ultimately need to do" being detailed/shown in one of the "Illustrative Pathways" described in Chapter 3?	Rejected. At this stage, these are high-level questions, not mapped one to one with an illustrative pathway.	Cheah Singfoong	Independent consultant, formerly more than 10 years with the National Renewable Energy Laboratory, USA	United States of America
839	4	26	4	34	Recommend adding a separate section at the beginning of Chapter 4 termed the "Statement of the Problem" that provides a well-organized, comprehensive, and targeted discussion of the climate crisis at hand. On several pages throughout the chapter, general comments are made that the pace and scale of societal change are too slow to limit the global average temperature increase to well below 2°C above pre-industrial levels, or to pursue a limit of 1.5°C, as set forth in the Paris Agreement. Examples are found on page 63 (lines 43 to 47) and page 69 (lines 15 to 21). Greenhouse gas (GHG) emission reductions must be steep over the near- and mid-term to achieve the temperature targets. Chapter 4 would be strengthened by organizing the general comments in an initial section of the chapter. Currently, the narrative is somewhat disorganized due to redundant statements made on different pages throughout the chapter which discuss the difficulties of keeping the temperature goals within reach.	Rejected. Outside of the scope of Ch4. The climate crisis is addressed in ch 1 of WG3, and at length in WG1. We will check for repetition, as in the 2nd part of the comment.	Michael Kennish	Rutgers University	United States of America
27723	4	28	4	34	The logical link between the two first sentences and the third one is unclear. The former refers to the NDCs and their implementation, the latter to the historical high emission paths.	Noted. Will check formulation.	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
45569	4	29	4	29	Could this gap be called an "implementation gap" and also explained a little better? It is not clear that this gap is the gap between policies and NDCs....it could be understood as the gap to 1.5 degrees etc. Pls pls change the phrasing here.	Accepted. will rephrase text on emissions gap to make clearly distinct from "implementation gap"	Daniel Crow	International Energy Agency	France
41309	4	30	4	30	The numbers 4 to 7 Gt CO2-eq in 2030 do not tell the reader much unless you relate it to something	Accepted. Text revised.	Jan Fuglestedt	CICERO	Norway
30155	4	32	4	34	Conceptually weak as elsewhere in the framing mitigation and changing development pathways are presented as complementary approaches	Rejected. The point here is that pursuing the same development pathway will lead to high emissions, so no contradiction to shifting development pathways being complementary to mitigation	Bert Metz	European Climate Foundation	Netherlands
27725	4	35	4	38	"What is a broad range of possible solutions? This chapter ...(See Chapter 2)." "Some countries, regions, cities, communities and non-state actors are taking the leadership in transformational change. Many technologies exist to bridge the emissions gap. Yet, despite these efforts, GHG emissions are projected to continue to rise (see Chapter 2). This chapter explores in broad terms an acceleration of mitigation and a shift of development pathways as possible solutions."	Noted. Will consider proposed rephrasing.	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
37245	4	37	4	38	Assumes that all that is required to bridge emissions gap is technologies. Should expand beyond technologies	Rejected. Next sentence indicates broader focus.	Michiel Schaeffer	Climate Analytics	Netherlands
27727	4	38	4	38	Please check the use of "lens"	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
27729	4	40	4	40	Please check whether the use of "thus" is warranted as the causal relationship is unclear.	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
46383	4	40	4	40	effective in what way? For reducing GHG emissions only, for reducing them in a 'just way' etc.	Noted. Will consider proposed rephrasing.	Henrik Carlsen	Stockholm Environment Institute	Sweden
27731	4	43	4	44	Please consider deleting the two "would"	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
37247	4	46	5	1	enabling conditions go beyond the 6 listed. Should include skills availability (different from institutional capacity), etc	Rejected. Here we only summarise 6 enabling conditions from SR1.5. Human capacities (incl skills) are mentioned as part of that enabling conditions in section 4.4.2.	Michiel Schaeffer	Climate Analytics	Netherlands
41307	4	1	6	9	find the intro section 4.1 very useful. I wonder if an illustration of the approaches taken in ch4 vs ch3 can be useful. Ch1 has a figure for the whole report, but a visualisation for ch3 and 4 could be useful; explaining how you work backwards from long term goals to near/mid terms implications of long term goals; with a focus on national levels etc.	Noted. We will consider adding a figure for the Ch3/Ch4 articulation, or building that into the x-ch box involving chapter 3 and 4	Jan Fuglestedt	CICERO	Norway
33143	4		6		Good	Noted. Thank you	Edris Alam	Rabdan Acadmey	United Arab Emirates
18831	4		42		Remote work options will help boost economic option of development pathway and in the long run mitigate climate change by reducing traffic pollutions from plying roads and other means of transportation	Rejected. Out of scope of Ch4. Remote work options should be dealt with in Ch5 (behaviour) and Ch10 (transport)	Michael Ugom	University of Nigeria, Nsukka	Nigeria
36217	4	3			Not only the five previous reports but also the special reports as well	Accepted. Text revised.	Youba Sokona	South Centre	Switzerland
20793	4	23			The meaning and the role of "(climate)" at the end of the sentence are unclear.	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
36219	4	44			Is it transformation or transition (please see chap1 and SR 1.5)	Noted. Hoelscher et al (2018) have written on the difference between transition and transformation, noting that partly it is explained by different schools of thought http://www.sciencedirect.com/science/article/pii/S2210422417300801 In this instance, we think transformation signals deeper change.	Youba Sokona	South Centre	Switzerland
20795	5	7	5	9	Expressions such as "Chapter 1", "chapters(6-11)", "Ch.17" lack consistency.	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
27733	5	11	5	11	Consider deleting "(the long-term is assessed in chapter 3)" as it overlaps with the next sentence	Accepted - Text Revised	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
41311	5	13	5	13	Regarding the long term perspectives given here and "or even 2300": If possible, this would be great. If you base this on info from WGI or SROCC then it would be useful to refer to these.	Accepted - Will check relevancy of reference to 2300 in Ch3	Jan Fuglestedt	CICERO	Norway

IPCC AR6 WGIII - First Order Draft Review Comments and Responses - Chapter 4

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
12923	5	15	5	18	Too many timescales, with too many undefined and uncertain terms make this sentence essentially meaningless!	Rejected. The terms "near-", "mid-" an "long-" terms are introduced at the beginning of paragraph.	Prashant Goswami	Institute of Frontier Science and Application	India
37003	5	17	5	18	Mentions nature of shifts in development pathway is needed. Chapter 5 which brings in the novel contribution of this shift through shifting of focus towards service provision away from current focus on output provision, how that be integrated with this chapter remains to be seen.	Noted. Links to Ch5 to be explored further in SOD.	Joyashree Roy	Asian Institute of Technology, Thailand. Jadavpur University, India	Thailand
7011	5	19	5	20	Would it be correct to say "while Chapter 4 studies based on quantitative modelling of mitigation and development pathways," is more accurately " which Chapter 4 considers based on quantitative modelling of mitigation and development pathways,"? If not the sentence needs to be clarified in any case.	Accepted - Text Revised	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNVIERSITY	Canada
46385	5	19	5	20	".. Based on quantitative modelling..": Yes, and this is an important point. In fact there are several points here: 1) Even if you are an insider to WG3 type of research, it is extremely hard follow what models are used, how the differ from each other, key characteristics, strengths and weaknesses etc. In most cases it is not even mentioned (apart from the ref.) what model has been used for a certain statement, or if one or several models have been used. I think this chapter needs a section that, in some detail (say 5-10 pages) describe the key models used. I know Appendix C exists, but i still think this chapter needs a tailor-made description of models used for this chapter.2) Given the debate in recent years regarding models, e.g. after the Nobel price in economics to Nordhaus and Romer (see e.g. Nature vol. 573, pp. 348-349), i think a more open and humble attitude towards pros and cons og models in this context is appropriate. As the text is now, it is - I think - rather unreflective. 3) In several cases comparisons are made based on 'one model, one country' approach, see e.g. Fig. 4.4. Given uncertainties - and differences - between models - how could I interpret those messages?	This is a 3-part comment. Part 1. Accepted. Short summary of models refered to in Ch4 to be included in SOD; Part 2. Noted. Will strive to fairly assess models. Part 3. Noted. Confidence statements to reflect diversity of underlying studies, including models	Henrik Carlsen	Stockholm Environment Institute	Sweden
27735	5	19	5	29	I found this paragraph very helpful. Shouldn't a similar paragraph be included in the other chapters mentioned?	Accepted. Will transmit to other chapters' CLAs	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
27737	5	37	5	37	Please check the use of "at regional level" – the EU is still formed of sovereign states.	Accepted - Text revised	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
37005	5	39	5	40	Ch 5 focuses on macroperspective of how wellbeing lens to focus on human need can widen the developmental actions to shift the pathways through innovative service provision for human need/welbeing	Accepted - Text revised	Joyashree Roy	Asian Institute of Technology, Thailand. Jadavpur University, India	Thailand
37007	5	45	5	45	Like adaptive capapcity the term mitigative capacity can be varying regionally, group specific , sector specific	Taken into account. Agree that mitigative capacity depends on circumstances, but this does not invalidate that particular sentence.	Joyashree Roy	Asian Institute of Technology, Thailand. Jadavpur University, India	Thailand
36221	5	7	8		This is a fundamental missing point of the Chapter 1 as a confusion is made between development and sustaible development. In fact you should say that "the extent that development pathways are the sustainable ONES"	Accepted. Text revised.	Youba Sokona	South Centre	Switzerland
36225	5	30	34		What about sustainable development and the SDGs literature	Accepted. Text revised.	Youba Sokona	South Centre	Switzerland
36227	5	42	43		what you mean by innovative development?	Accepted. Text revised.	Youba Sokona	South Centre	Switzerland
36229	5	43	44		I wonder if you have had any interaction with Chap1 as they are talking about the context of sustainable development and I wonder if you are talking about the same. If yes please explain and if no please give reasons	Taken into account. Many discussions, including on SD, ongoing with Chapter 1	Youba Sokona	South Centre	Switzerland
36223	5	27			As you are considering development pathways you should consider along with mitigation low and zero carbon development options as many countries in particular the poorer ones do have very limited mitigation potential and they need to avoid emission in their development trajectories	Accepted. Will assess literature on "avoided emissions"	Youba Sokona	South Centre	Switzerland
27739	6	1	6	1	"that collective" è "that current collective"	Accepted - Text revised	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
15773	6	1	6	9	I expected to find in this chapter a list of different interventions and / or climate actions that a policy maker / executive has at disposal to reach a temperature at the 1.5 - 2.0 range. However, there is a mixed framing between development paths and mitigations paths, and this might confuse some readers. Where does the answer to the question "What are my options / what are the possible climate actions?" that a policy maker or executive can make? I think that this should be clearly stated do more climate action gets done.	Taken into account. Section 4.2 describes content of mitigation pathways, and 4.4. policy options to shift development pathways.	EDUARDO PEDRO FRACASSI	ITBA Instituto Tecnologico de Buenos Aires	Argentina
20797	6	18	6	42	A more focused discussion on the new/updated NDCs that will be submitted in 2020 needs to be included in this section considering the timing of the final AR6 publication. Also, a categorized comparison among NDCs (which is briefly described in lines 24-42, currently) in a Table would be very informative to readers.	Taken into account. Will include updated NDCs depending on availability.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
24959	6	19	6	20	It is stated that INDCs became first NDCs in ratification, but some Parties revised their INDCs to be considered as their first NDCs	Accepted - Text revised	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
32197	6	21	6	21	Please clarify 99% of total anthropogenic GHG emissions of which year are being referred to.	Accepted - Text revised	LOKESH CHANDRA DUBE	NATCOM Cell, Ministry of Environment, Forest and Climate Change, Government of India	India
35859	6	24	6	30	Is it possible to show this in a graphical form mentioning exactly the number of NDCs and their type (BAU/intensity/etc)?	Taken into account. Will consider a figure	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
28675	6	30	6	30	"other" is not needed, as the sentence is talking about 'developing' countries needing finance from 'developed' countries.	Accepted - Text revised	Takeshi Kuramochi	NewClimate Institute	Germany
46279	6	30	6	30	some NDCs were conditional on global momentum (Australia for example)	Accepted - Text revised	Yann Robiou du Pont	IDDRI	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
28677	6	41	6	41	AR2 >> perhaps more commonly referred to as SAR ?	Editorial – copyedit to be completed prior to publication	Takeshi Kuramochi	NewClimate Institute	Germany
16609	6	11	7	43	Politically weaken Paris Agreement outcomes in related to the NDCs, should not just concentrate on mitigation targets, but also actions after five years (2020) should be evaluated.	Noted. Will consider how to address comment.	Mostafa Jafari	Head of TPS for LFCCs/ and IPCC LA	Iran
36231	6			41	This whole 4.2 is about NDCs are limited to G20+ and the other countries as whole have been left out. Could you please explain? NDCs are important for mitigation but are not the only vehicle.	Accepted. Section 4.2. is not limited to G20. Literature, however, is highly skewed towards China and few other countries. Will strive to represent non-G20 countries.	Youba Sokona	South Centre	Switzerland
18545	6	10		42	13 One element of accelerating mitigation seems missing or not sufficiently covered: that small groups of actors induce change that is then automatically picked up by others, e.g. a group supporting renewables, which are now mainstream, or a group supporting electric vehicles, which are now much cheaper. Related literature includes http://energy-transitions.org/content/accelerating-low-carbon-transition https://exponentialroadmap.org https://climateactiontracker.org/publications/transformation-points/ http://www3.weforum.org/docs/WEF_the_speed_of_the_energy_transition.pdf	Rejected. Outside of scope of Ch4. Role of small groups of actors in inducing technological/behavioural change dealt with in Ch5, 16 and 13.	Niklas Höhne	NewClimate Institute	Germany
45511	6	12			17 The central instruments of the Paris Agreements is the Nationally Determined Contributions (NDCs), submitted by each country reflecting efforts to reduce GHG emissions and build resilience to the impacts of Climate change. The UNFCCC should also set up committee to properly checked and monitored the progress, future trends globally on the NDCs.	Rejected. Out of scope of the Report.	Abiodun Adegoke	Samsung electronics West Africa	Nigeria
46281	7	2		7	2 also recommend citing “Gerd Winter, CASE COMMENT Armando Carvalho and Others v. EU: Invoking Human Rights and the Paris Agreement for Better Climate Protection Legislation Transnational Environmental Law, 9:1 (2020), pp. 137–164 © 2020, Doi: 10.1017/S2047102520000072”	Noted. Will review proposed reference.	Yann Robiou du Pont	IDDRI	France
20799	7	5		7	10 Is Pauw et al. 2018 the only reference for the main argument of this paragraph that NDCs mostly lack clarity/transparency? Only one source of information doesn't seem to be sufficient to support an idea..	Accepted. Other reference to be included.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
841	7	5		7	12 One concern with Chapter 4 is that it relies heavily on the efficacy of NDCs, yet there are significant problems with the NDC database. As noted by Pauw et al. (Climatic Change, 147:23-29, 2018), NDCs are difficult to analyze and compare, while also being uneven in coverage. They describe mitigation actions but often lack sufficient details on mitigation goals, which also need to be more comparable. In addition, many mitigation actions do not define emission reductions directly, and their effect on emissions is estimated indirectly. NDCs vary in scope and content in different countries and need to be more transparent. Furthermore, they provide insufficient details on costs and implementation financing. It would be informative to expand the discussion of these considerable deficiencies on page 7. An important part of this is to examine how the deficiencies may affect the overall accuracy of projected emission reductions.	Accepted. Uncertainties on emission reductions associated with NDCs to be reviewed in 4.2.2.6	Michael Kennish	Rutgers University	United States of America
13135	7	6		7	7 The Paris Rulebook however is specific, at least in some parts, this should be mentioned. The Rulebook constitutes subsequent agreement of States on the interpretation of Treaties in the sense of Article 31(3)(a) of the 1969 Vienna Convention on the Law of Treaties and the ILC draft conclusions, See P. Petra Minnerop, 2020, The legal effect of the ‘Paris Rulebook’ under the doctrine of treaty interpretation, in Peter Cameron, Volker Roeben and Mu Xi (eds), Global Energy in Transition (Hart Publishing, forthcoming 2020	Rejected. The Paris Rulebook is mentioned in next sentence.	Petra Minnerop	University of Dundee	United Kingdom (of Great Britain and Northern Ireland)
24961	7	7		7	8 Not all elements of the Paris rulebook have been adopted (e.g. Article 6 remains unresolved)	Accepted - Text revised	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
46283	7	8		7	8 The adoption of the rule could not affect existing NDCs. Phrasing is unclear when stating “the information included in the NDCs remains uneven” given that they could not be affected. I am also surprised to read so many comments on the unevenness of NDCs without mentioning the differentiated requirements from the UNFCCC to developing and developed countries. This would help the reader understand.	Accepted - Text revised	Yann Robiou du Pont	IDDRI	France
18491	7	13		7	13 the peer-reviewed literature on NDCs extends to about 580 journal articles: need to specify the language, English journals or all English and all in other languages as well. reason: other languages also publish peer-reviewed journal articles, too.	Accepted - Text revised. This is a fair point.	Jiahua Pan	Chinese Academy of Social Science	China
843	7	13		7	22 More detail should be added at the end of Section 4.2.1 on the subset of 580 journal articles to synthesize quantitative estimates on large emitting countries relevant for effective NDC assessment. What does the assessment of the articles show for these large emitting countries? General findings on countries with a large body of literature on NDCs listed at the end of Section 4.2.1 would be informative for the reader.	Noted. Planned boxes on the NDCs of large countries aim to do just that.	Michael Kennish	Rutgers University	United States of America
28679	7	13		7	22 It might be important to reiterate specifically in this section that the numbers here are based on peer-reviewed literature published in English, and that there will likely be many more studies published in non-English journals.	Noted	Takeshi Kuramochi	NewClimate Institute	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
27907	7	15	7	20	IPCC states, "but only a subset of those articles include quantitative estimates that are relevant for the NDC assessment in Section 4.2.2. The regional distribution is not uniform but focuses mostly on large emitting countries. It reveals a large predominance of studies about China (though not necessarily from authors in China) with some 125 articles (20% of total). Other countries and regions with a large body of literature on NDCs include India (12%), Brazil (8%), the European Union (7.5%), Indonesia and Japan (5% each)." However, two papers not referenced that quantify sector-by sector and fuel-by-fuel 2050 targets for 143 and 139 countries, respectively (including China, U.S., all countries of the EU, and India) are Jacobson, M.Z., M.A. Delucchi, M.A. Cameron, S.J. Coughlin, C. Hay, I.P. Manogaran, Y. Shu, and A.-K. von Krauland, Impacts of Green New Deal energy plans on grid stability, costs, jobs, health, and climate in 143 countries, One Earth, 1, 449-463, doi:10.1016/j.oneear.2019.12.003, 2019. https://web.stanford.edu/group/efmh/jacobson/Articles/I/WWS-50-USState-plans.html and 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, https://web.stanford.edu/group/efmh/jacobson/Articles/I/WWS-50-USState-plans.html It appears these papers are relevant to the discussion.	Noted. Will review proposed reference.	Mark Jacobson	Stanford University	United States of America
16451	7	25	7	29	For China's NDC, I believe the most important three papers are Lugovoy et al (2018; Multi-model comparison of CO2 emissions peaking in China: Lessons from CEMF01 study; doi: https://doi.org/10.1016/j.accre.2018.02.001), Zhou et al (2019, A roadmap for China to peak carbon dioxide emissions and achieve a 20% share of non-fossil fuels in primary energy by 2030; doi: https://doi.org/10.1016/j.apenergy.2019.01.154) and Gallagher et al (2019; Assessing the Policy gaps for achieving China's climate targets in the Paris Agreement; doi: https://doi.org/10.1038/s41467-019-09159-0), which are not even listed here. We do not need to consider all fragmented literature. Focusing on multi-model assessments and high rating journals is enough.	Noted. Will review proposed reference.	Xunzhang Pan	School of Economics and Management, China University of Petroleum, Beijing 102249, China	China
20801	7	23			The reason why these countries for an additional text box are chosen should be specified. In terms of the share of the literature, Brazil seems the one to be included instead of US.	Rejected. Basis for selection is level of emissions, much smaller in Brazil.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
34801	8	1	8	23	The sentences are convoluted. The sentences should be distilled by following or highlighting the basic policy.	Editorial – copyedit to be completed prior to publication	Onema Adojoh	Missouri University of Science and Technology, Rolla, USA	United States of America
46387	8	15	8	15	I didn't know IPCC used non peer-reviewed literature. Please explain selection criteria for such literature.	Rejected. Use of non peer-reviewed literature is permitted under IPCC rules, and procedures are in place to ensure that such literature can be traced. This general matter would benefit from an explanation across report.	Henrik Carlsen	Stockholm Environment Institute	Sweden
10235	8	26	8	28	As part of UNFCCC (NCs and BRs) submissions, a variety of countries in addition to the 'with current measures' scenario also submit a 'with additional measures' scenarios. Why are these scenarios ignored in this study? If not included in the table 4.2, perhaps it is least worth mentioning them?	Rejected. The current policy scenarios analysed here project GHG emissions assuming all currently adopted and implemented policies (defined as legislative decisions, executive orders, or equivalent) are realized and that no additional measures are undertaken. Therefore, we will not be able to consider the additional measures scenarios in countries' submissions to UNFCCC. However, where relevant, updates of current policies projections that may address the issue for some countries/regions will be included.	Aglaiä Obrekh	Environment and Climate Change Canada	Canada
45571	8	35	8	35	It is not clear if the WEO in parentheses is referred to as a hybridized approach in this sentence, or whether this is an example of an emissions pathway.	Editorial – copyedit to be completed prior to publication	Daniel Crow	International Energy Agency	France
4979	8	38	8	43	It is relevant to minimize the uncertainty of the calibration parameters of climate models	Rejected. There is no statement on the calibration of climate models in this paragraph. It only states that global system models (also referred to as integrated assessment models) integrate climate models.	MARIA DEL VALLE MORRESI	UNIVERSITY	Argentina
7013	8	40	8	41	Suggest changing "National models are typically more granular, often representing technologies and linkages in an economy, relevant to national development pathways." to "National models typically include more detail on sectors, technology, behaviour, and intersectoral linkages, but often must use simplifying assumptions for international trade (e.g. the Armington elasticity approach). Critically, they can also better reflect local socioeconomic and political conditions and their evolution (i.e. national development pathways)."	Accepted - Text revised	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNNIVERSITY	Canada
46389	8	42	8	42	myopic and with foresight'. Please explain	Rejected. Outside of scope of Ch4. Explanation is provided in Annex C as highlighted in the text.	Henrik Carlsen	Stockholm Environment Institute	Sweden

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
2993	8	24	10	6	NDCs are very heterogeneous in terms of units, scope and coverage, time frame, targets and sectors and level of certainty. One source of differences among modeling studies is with respect to how NDCs are measured, represented, and aggregated in models. This dimension needs to be added to the five methodological issues raised in the section.	Rejected. Information is provided on page 9, line 39 to page 10, line 6. Information about policy coverage is also included in the first table in the supplementary material to Chapter 4.	Mustafa Babiker	Aramco	Saudi Arabia
845	8	24	11	12	Literature assessment of emission outcomes indicate NDCs vary considerably which affects clarity and effectiveness. For example, some studies target different spatial scales. Studies differ in the level of coverage of different emitting sectors. GHG coverage is not consistent across studies. In addition, scenarios that are covered vary widely. The way that policies are represented differ in the studies, and the policy coverage varies across the studies as well. How does all of this uncertainty affect the accuracy of projected emissions reduction in the near- and mid-term?	Accepted. The comment is valid. The assessment in Chapter 4 therefore explicitly distinguishes the most relevant differences in sectoral coverage (AFOLU) and GHGs (CO2 vs. Kyoto basket).	Michael Kennish	Rutgers University	United States of America
16223	8	1			In Section 4.2.2 Aggregate effects of NDCs and current policies, consider adding a description of military contributions to GHG emissions, for clarity and accuracy.	Rejected. Military contributions are generally covered by the studies, but based on the state of the literature, they cannot be singled out.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
45513	8	18		23	Inconsistency in NDCs data can affect future projection on GHG emissions. Collective efforts of NDCs in relation to UNFCCC must draw conclusions on both sides of the temperature pathways and current policies of 2030 GHG emissions from long-term temperature pathways.	Accepted. The assessment in Chapter 4 draws on both national and global studies. In addition, cross-chapter-box 1 brings together temperature pathways assessed in Chapter 3 and studies assessed in Chapter 4	Abiodun Adegoke	Samsung electronics West Africa	Nigeria
27741	9	34	8	35	You might want to be more explicit	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
41313	9	4	9	8	In addition to mentioning the issues about which gases that are included in GHG, you could also mention which GWPs are used (SAR, TAR, AR4, AR5)	Accepted. Text revised.	Jan Fuglestedt	CICERO	Norway
37227	9	18	9	20	An additional reference here is Fyson and Jeffery 2018: Ambiguity in the land-use component of mitigation contributions towards the Paris Agreement goals, Earth's Future. This paper looks at the uncertainty in LULUCF components of NDCs.	Noted. Will assess proposed reference.	Michiel Schaeffer	Climate Analytics	Netherlands
10233	9	19	9	20	When talking about the AFOLU sector, some NDCs are accounting for forestry sector using reference level approach, vs others using the net-net approach. It might be an important consideration for the calculation of the emissions levels under NDCs/Current Policies Scenarios.	Accepted. Issue to be addressed in SOD.	Aglaija Obreht	Environment and Climate Change Canada	Canada
7015	9	24	9	28	To potentially add: "Some national studies attempt to target both energy system and AFOLU emissions, especially if AFOLU is particularly significant (e.g. in the Latin American Deep Decarbonization Project (Bataille et al 2020, submitted to Energy Strategy Reviews)). Careful separation of CO2 and other gases, while both were accounted for, is necessary to assess long term compliance with the Paris Agreement targets." Source: Bataille, C., H. Waisman, A. Vogt Schilb, M. Jaramillo, R. Delgado, R. Arguello, L. Clarke, T. Wild, F. Lallana, G. Bravo, G. LeTreut, G. Nadal, G. Godinez, J. Quiros-Tortos, E. Pereira, M. Howells, D. Buira, J. Tovilla, J. Farbes, R. Jones, D. De La Torre Ugarte, M. Collado, F. Requejo, X. Gomez, R.Soria, D. Villamar, P. Rochedo, M. Imperio, Y. Briand, J. Svensson. 2020. Net-zero deep decarbonization pathways in Latin America: challenges and opportunities. Energy Strategy Reviews. Submitted and under review.	Rejected. The paragraph p9 lines 25-28 describes caveats related to studies that do not cover all sectors. Ch4 explicitly distinguishes the most relevant differences in sectoral coverage (AFOLU) and GHGs (COS vs. Kyoto gases) of studies.	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNIVERSITY	Canada
41315	9	26	9	26	This group of gases could perhaps also be referred to as "Kyoto gases" - as you do in table 4.1	Accepted. Text revised.	Jan Fuglestedt	CICERO	Norway
2275	9	18	24	9	This paragraph should also discuss about IPPU and Waste sector.	Rejected. The literature on IPPU emissions is unfortunately thin which makes it difficult to include comprehensively. However, for some countries/regions where data is available and the sector is particularly large, the topic is discussed.	Mid Arfan Uzzaman	FAO	Bangladesh

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
1345	10	7	10	7	<p>There are more literature on Asian national NDC assessment.</p> <p>Thai: Chunark P, Limmeechokchai B, Fujimori S, Masui T. Renewable energy achievements in CO2 mitigation in Thailand's NDCs. Renewable Energy 2017, 114: 1294-1305.</p> <p>Vietnam: Thanh Tu T, Fujimori S, Masui T. Realizing the Intended Nationally Determined Contribution: The Role of Renewable Energies in Vietnam. Energies 2016, 9(8).</p> <p>Indonesia: Hasegawa T, Fujimori S, Boer R, Immanuel GS, Masui T. Land-based mitigation strategies under the mid-term carbon reduction targets in Indonesia. Sustainability 2016, 8(12).</p> <p>Fujimori S, Siagian U, Hasegawa T, Yuwono B, Boer R, Immanuel G, et al. An assessment of Indonesia's intended nationally determined contributions. In: Fujimori S, Kainuma M, Masui T (eds). Post-2020 Climate Action: Global and Asian Perspective. Springer, 2017, pp 125-142.</p> <p>China: Liu J-Y, Fujimori S, Takahashi K, Hasegawa T, Wu W, Takakura Jy, et al. Identifying trade-offs and co-benefits of climate policies in China to align policies with SDGs and achieve the 2 °C goal. Environmental Research Letters 2019, 14(12): 124070.</p> <p>This literature also discusses multi-sectoral implications of the mitigation policy</p>	Noted. Will review proposed reference.	Shinichiro Fujimori	Kyoto University	Japan
14709	10	7	10	9	<p>In Table 4.1 an additional global NDC study can be included which assesses the NDCs and their inherent uncertainty in determining global GHG emissions levels: Rogelj, J., Fricko, O., Meinshausen, M., Krey, V., Zilliacus, J.J., Riahi, K., 2017. Understanding the origin of Paris Agreement emission uncertainties. Nature Communications 8, 15748. https://doi.org/10.1038/ncomms15748</p>	Rejected. Rogelj et al 2017 is used in section 4.2.2.6. In Table 4.1., we refrained from using multiple modeling studies based on the same modeling framework, but only used the latest to avoid model bias.	Joeri Rogelj	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
34803	10	9	10	9	<p>The Table 4.1 stating the "Overview of methods used for projected emissions of NDCs and/or current policies" is looks scattered. A better format should be used as the authors information as in disarray.</p>	Editorial – copyedit to be completed prior to publication	Onema Adojoh	Missouri University of Science and Technology, Rolla, USA	United States of America
28681	10	7	11	1	<p>Table 4.1: For Japan, following studies could also be added to the list or to the supplementary material table:</p> <p>Kuramochi, T., Wakiyama, T. and Kuriyama, A. (2017) 'Assessment of national greenhouse gas mitigation targets for 2030 through meta-analysis of bottom-up energy and emission scenarios: A case of Japan', Renewable and Sustainable Energy Reviews. Elsevier, 77(November), pp. 924–944. doi: 10.1016/j.rser.2016.12.093.</p> <p>Kuriyama, A., Tamura, K. and Kuramochi, T. (2019) 'Can Japan enhance its 2030 greenhouse gas emission reduction targets? Assessment of economic and energy-related assumptions in Japan's NDC', Energy Policy, 130, pp. 328–340. doi: 10.1016/j.enpol.2019.03.055.</p>	Noted. Will assess proposed reference.	Takeshi Kuramochi	NewClimate Institute	Germany
16453	10	7	11	5	<p>I suggest to delete this table. Using a table to list modeling papers in main texts doesn't make sufficient sense. Putting in the supplement or annex is OK.</p>	Accepted. Material in Table 4.1. will ultimately be moved to Supplementary material.	Xunzhang Pan	School of Economics and Management, China University of Petroleum, Beijing 102249, China	China
2273	10	7	11	9	<p>The table contains only two emission sectors. Its better to include IPPU and Waste sector also.</p>	Rejected. The literature on IPPU emissions is unfortunately thin which makes it difficult to include comprehensively. However, for some countries/regions where data is available and the sector is particularly large, the topic is discussed.	Md Arfan Uzzaman	FAO	Bangladesh
20803	10	7			<p>The last row in the Table S4.1 "EIA Annual Energy Outlook 2019" is missing in this Table 4.1. If intended, please note.</p>	Noted	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20805	10	8			<p>Double parentheses between Jiang et al.2013 and Benavides et al.2015</p>	Accepted	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
34713	10	9			<p>In Table 4.1, Oshiro et al. 2019 cover not only the scenarios from 2 National models (AIM and DNE21+) but also those from seven Global IAMs.</p>	Noted. The scenarios from the seven global models were previously published in McCollum et al (2018) which is used as the reference.	Ken Oshiro	Kyoto University	Japan
24457	11	19	11	21	<p>The statement needs to be rephrased e.g., the global results are from global models presented in Chapter 3</p>	Rejected. Ch4 draws on both global and national/subnational models.	Subash Dhar	UNEP DTU Partnership, DTU	Denmark
45573	11	34	11	34	<p>pls include some reference to LULUCF here as well</p>	Rejected. Unless stated otherwise, all sectors and GHGs are included in the estimates.	Daniel Crow	International Energy Agency	France
34711	11	30	12	6	<p>There are several literatures focusing on the collective NDC emissions after the cut-off of the SR1.5. While the sentences in this FOD might be robust, these literature should be included as much as possible. Following papers came to my mind.</p> <p>- Fujimori et al. https://doi.org/10.1007/978-981-10-3869-3_2</p> <p>- Fujimori et al. https://doi.org/10.1186/s40064-016-3235-9</p>	Noted. Will review proposed reference.	Ken Oshiro	Kyoto University	Japan

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Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
20807	11	16			"30 studies" is stated in text but "# studies" column in Table 4.2 is totally blank.	Accepted - Text revised	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
45515	11	27		33	Comprehensive system modelling, integrated approach and measures, should be put into consideration between the UNFCCC and NDCs. Global comprehensive awareness and studies should be put into consideration inline with the UNFCCC secretariat to assessed the effects of NDCs twice. (Temperature of 2°C and 1.5°) sould put in place along with comprehensive studies.	Rejecte. The UNFCCC in its assessment of global effects of NDCs draws on exactly the same literature as the one referenced in Ch4. Adding the UNFCCC estimates as independent studies would therefore lead to double counting. In addition, the UNFCCC estimates are quite dated by now and do not reflect the latest data.	Abiodun Adegoke	Samsung electronics West Africa	Nigeria
16071	12	3	12	3	Not sure that this is best characterised as a "gap". Rather the NDCs are projected to reduce emissions 4-7 GT below current policies. In other words, they help close the gap. After writing this comment, I have just seen 4-18, line 7 where you talk of an implementation gap between current policies and NDCs. Perhaps this is what you mean here too? IF so, please specify and use the term implementation gap here too.	Accepted. Text revised.	Navroz Dubash	Centre for Policy Research	India
4981	12	3	12	6	Generally, in underdeveloped countries there is a lack of public policies that consider priority the mitigation of effects of the CC and the pre-preservation of natural resources, for example: mining industries in Argentina	Noted	MARIA DEL VALLE MORRESI	UNIVERSITY	Argentina
37249	12	5	12	6	This section need to also reflect that not only policies are going to enable countries in meeting their NDCs. Action is critical. action more important than intention.	Noted	Michiel Schaeffer	Climate Analytics	Netherlands
27743	12	17	12	17	"studies tend to show higher projections of current policies and NDCs in 2030" The formulation is ambiguous, also the one of lines 19-20	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
46391	12	20	12	22	Too vague	Accepted. Data permitting, this statement will be sharpened in the SOD.	Henrik Carlsen	Stockholm Environment Institute	Sweden
20809	12	23	12	31	Information in this paragraph should be also updated once updated NDCs are covered in this chapter.	Accepted. As described p12, lines 7-19, our intention is to update estimates based on revised NDCs.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
10231	13	30	13	31	LULUCF (mitigation) as well as REDD + are mentioned; what about LULUCF (accounting contribution), how many NDCs included the accounting contribution from LULUCF?	Rejected. Unclear what "accounting contribution" from LULUCF means.	Aglaiia Obrekht	Environment and Climate Change Canada	Canada
8813	13	37	13	37	It may be helpful to add a column to Table 4.2 about the current situation (2018/2019) because some countries may be well off track in terms of the GHG/CO2 emissions deployment compared to what is targeted in their NDCs	Noted. Currently, Table 4.2 includes countries' GHG share for 2018. While absolute numbers for the GHG metric can be added, due to space constraints, it will not be possible to add 2018 estimates for all metrics used in Table 4.2. We will consider providing that material as part of the supplementary material to Chapter 4.	Saygin Değer	SHURA Energy Transition Center	Turkey
10229	13	37	13	37	Table 4.2: Will the CP national official numbers we updated to include information from BR3 submissions to UNFCCC?	Noted. As described page 12 lines 7-9, our intention is to update estimates, and this includes also official submissions in UNFCCC, based on reviewed methods.	Aglaiia Obrekht	Environment and Climate Change Canada	Canada
16455	13	37	13	37	A very great table! However, please make clear whether CO2 only indicates fossil-fuel combustion in the energy sector or also includes industrial processes. If the latter case, for China, the inventory data is 10.2 GtCO2 in 2014 (https://di.unfccc.int/detailed_data_by_party). The NDC emissions here, 10.6 (10.1-11) GtCO2, seem lower than most existing assessments and inconsistent with Figure 4.2. Only with additional efforts can China control its fossil and industrial emissions within 10-11 GtCO2 in 2030. Please further investigate the literature and check the data.	Accepted. The data situation regarding industrial process emissions in the literature is difficult and typically the contribution is not reported separately and often it is not explicitly documented whether process emissions are included or not. We have added a discussion of this point, noting that for some countries, most notably China, this is relevant.	Xunzhang Pan	School of Economics and Management, China University of Petroleum, Beijing 102249, China	China
35863	13	37	13	37	Table 4.2: As I can understand, the emissions are calculated based on both conditional and unconditional targets. Could it be done separately as the finance required for the unconditional targets is very high and not meeting them is highly possible as the reason would be unavailability of finance.	Taken into account. Our intention is to separate between conditional and unconditional NDCs in Table 4.2. Most countries listed in Table 4.2 thus far only have published unconditional NDCs. Therefore, at present only the global estimates in the FOD distinguish between conditional and unconditional NDCs (separated by "/").	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
46393	13	1	14	1	Interesting information, but could be communicated more efficiently.	Rejected. Comment does not provide specific suggestion for how to communicate more efficiently.	Henrik Carlsen	Stockholm Environment Institute	Sweden
24459	13	37	14	38	Since NDC conditional and unconditional have different levels of ambition why have they been combined in this Table. If the lower value of range is for conditional and higher for unconditional this should be clarified	Taken into account. Our intention is to separate between conditional and unconditional NDCs in Table 4.2. Most countries listed in Table 4.2 thus far only have published unconditional NDCs. Therefore, at present only the global estimates in the FOD distinguish between conditional and unconditional NDCs (separated by "/").	Subash Dhar	UNEP DTU Partnership, DTU	Denmark

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Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
20815	13	37	14	40	Footnote c of Table 4.2 states that only "global" level values for conditional NDCs are provided. But the last row of the table provides both uncon/con. values and it is described in text(p.13, lines 34-36). Does "global" in the footnote mean "globally comprehensive studies"? If so, then the table needs to be revised. As stated in page 11 line 17-19, Table 4.2 allows comparing emission projections from national/globally comprehensive studies and official communications. Considering the "National" values and "Official" values contain both conditional and unconditional NDCs, the comparison between those values would be inappropriate and misleading. For a comparison purpose, the table should include only "conditional" NDCs. The best case would be to include both, provided that "unconditional" NDCs information becomes available during the drafting process...	Taken into account. Our intention is to separate between conditional and unconditional NDCs in Table 4.2. Most countries listed in Table 4.2 thus far only have published unconditional NDCs. Therefore, at present only the global estimates in the FOD distinguish between conditional and unconditional NDCs (separated by "/").	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20811	13	37	14	41	The categories of "Type" (the 4th column) in Table 4.2, "global/national/official" are little confusing. Instead, "Type of studies" would be better for understanding.	Accepted - text revised	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20813	13	37	14	41	# studies column is blank	Accepted - text revised	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
18493	13		14		emissions including and excluding AFOLU: the numbers are somewhat confusing and can be misleading. to make the numbers simpler and easier to understand, just 2 categories: energy related emissions, AFOLU(negative numbers, sinks, positive numbers, emissions).	Rejected. Unfortunately not all studies allow the separation as suggested and therefore the proposal cannot be implemented.	Jiahua Pan	Chinese Academy of Social Science	China
20241	13		14		In 2020 some country may submit new or updated NDCs so this table should be checked and updated if necessary.	Noted. As described page 12 lines 7-9, our intention is to update estimates, and this includes also official submissions in UNFCCC, based on reviewed methods.	Thi Lan Huong Huynh	Viet Nam Institute of Meteorology, Hydrology and Climate change	Vietnam
28683	13		14		Table 4.2: I have led a similar analysis for the UNEP Emissions Gap Report over the last several years. I'd be very happy to contribute to developing/updating this table in a consistent manner. A number of suggestions here: 1. On GHG share values, it would be important to provide figures in both incl. and excl. AFOLU/LULUCF. I believe Chapter 2 would be able to provide values. 2. Country selection: It seems they're G20 minus EU MS and Saudi Arabia. I would suggest to add Saudi Arabia if feasible - there are some projections available (as covered in the UNEP Emissions Gap Report). 3. Many NDCs refer to LULUCF, not AFOLU, and thus most studies also refer to LULUCF. Clarification is needed why AFOLU is used here. 4. On "Current Policies" : it is important to set a certain cut-off date for the publication year, otherwise it's not "current policies" anymore. This is particularly important when countries are accelerating with policy implementation in many parts of the world. 5. Do "Current policies" scenario projections from "Official" documents automatically include e.g. "With measures" scenario projections reported in BRs/BURs/NCs? Since different countries make different interpretations of those UNFCCC scenarios, each "with (without/additional) measures" scenario projections need to be handled with caution when comparing in such a format. 6. Other point on official studies: countries like Australia and Canada publishes annual projections outside the UNFCCC process, so they can also be included and mentioned in the footnote b. 7. It is not clear whether GWPs are harmonised. I'm not sure if there's a standardised approach to handling emission values with different GWPs, but this can have a fairly large impact in countries where CH4 emissions are large.	This is a 7-part comment. 1/ Noted: Adding GHG shares in-/excl. AFOLU is possible, but due to space constraints may have to be done as part of supplementary material, 2/ Accepted: Country selection is constrained by data availability and will be expanded towards SOD; 3/ Accepted: Correct distinction of AFOLU/LULUCF will be taken care of (also to ensure consistency with UNEP gap reports); 4/ Accepted: Cut-off dates of studies are indicated in Table S4.1 in the supplementary material and will be consistently applied in the final analysis; 5/ Accepted: Addressed by EGR 2019; 6/ Noted: Additional studies are taken on board to the degree the material is available; 7/ Accepted: Harmonization of GWPs will be taken care of where needed.	Takeshi Kuramochi	NewClimate Institute	Germany
1941	13	37			The basis of this figure is not clear (references and source of numbers), nor is the connection between statements about ranges in the text and ranges in the Table. Since this table is important for gauging the implementation gap (a central topic for this chapter), it is important that its basis be clear.	Taken into account. The basis of the Table is documented in the supplementary material to Chapter 4, in particular Table S4.2. In addition, our intention is to make all underlying data as well as the data processing workflow public once the report is finalized.	Haroon Khesghi	ExxonMobil Research and Engineering Company	United States of America
34715	13	37			Table 4.2 seems informative mainly for the countries that submitted their NDCs with emission intensity (e.g. t-CO2/GDP) indicators. In this regards, developing countries information needs to be added for here. For the Asian countries, the articles in this book would help to fill the numbers for Thailand, VietNam, etc. Post-2020 Climate Action: Global and Asian Perspectives (https://www.springer.com/us/book/9789811038686)	Noted. Will assess proposed reference.	Ken Oshiro	Kyoto University	Japan
20817	14	37			Please double-check the values in "KOR" row; the values in the last two columns are identical=0.46(0.44-0.47), but they shouldn't be.	Accepted - Text revised	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
35861	15	5	15	6	through the Biennial Transparency Report.	Accepted - Text revised.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
20819	15	9	15	10	Unnecessary parentheses between references.	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
7017	15	12	15	14	This sentence is important but has no backing. The entire paragraph is very jumbled and needs thought and distillation.	Accepted - text revised	CHRISTOPHER BATAILLE	IDDR.ORG/SIMON FRASER UNIVERSITY	Canada
27745	15	16	15	17	I cannot understand the sentence.	Accepted - text revised	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
24461	15	21	15	21	after gap add in 2030 to make the year clear	Accepted - text revised	Subash Dhar	UNEP DTU Partnership, DTU	Denmark

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Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
847	15	21	15	29	The United States will likely withdraw from the Paris Agreement in November 2020. Withdrawal from the Paris Agreement will eliminate the requirement of further action to meet its NDCs. A statement should be made at the end of line 29 explaining the effect of a country's withdrawal from the Paris Agreement on future GHG emissions and mitigation goals, particularly with respect to countries that contribute a significant fraction of the total global emissions. How will withdrawal of a major country also affect subsequent actions of other countries remaining in the Paris Agreement?	Accepted As described page 12 lines 7-9, our intention is to update estimates, and this includes also official submissions in UNFCCC, based on reviewed methods. This includes the withdrawal of the U.S. from the Paris Agreement.	Michael Kennish	Rutgers University	United States of America
20823	15	21	15	29	Considering the assessments of the studies (cited in den Elzen et al. 2019b) were not based on the most up-to-date policies of countries and only covered G20 countries, listing up specific countries here, without any details of the assessment procedure, seems inappropriate and unnecessary. It could only become highly sensitive issue. Moreover, for some countries, the assessment result is contradictory to the values shown in Table 4.2; most of the CP values for EU is smaller than the NDC counterparts, meaning that they are overachieving their goals. It appears that information provided in Table 4.2 is sufficient for the purpose of assessing progress of countries in implementing NDCs.	Rejected. While Table 4.2 provides the quantitative basis for the assessment, Chapter 4 is also tasked with reviewing the conclusions in the published literature. Therefore Table 4.2 and this paragraphs should not be viewed as substitutes, but as complements.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
27747	15	26	15	29	The formulation is ambiguous	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
10831	15	30	15	30	Title of section 4.2.2.5 includes assessment of ambition of NDCs. Yet no literature discussing marginal abatement cost (MAC) is cited. Please add here discussion of the comparison of MAC among countries. Two literatures I have found are Aldy et al. "Economic tools to promote transparency and comparability in the Paris Agreement", Nature Climate Change (2016), Akimoto et al. "The analyses on the nationally determined contributions and the expected global emission pathways" Evolut Inst Econ Rev 2016. Authors of this chapter may easily find other literatures on this issue.	Accepted. Will review suggested literature.	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan
18539	15	38	15	43	It would be useful, if here the content of the cited literature is summarised. Currently the text only states that there is literature.	Accepted - text revised.	Niklas Höhne	NewClimate Institute	Germany
28685	15	38	15	43	The following study provided one approach to assess countries' 2030 targets taking into account a range of effort sharing approaches and the idea of long-term emissions budget management: Kuramochi, T., Asuka, J., Fekete, H., Tamura, K., and Höhne, N. (2016). Comparative assessment of Japan's long-term carbon budget under different effort-sharing principles. Clim. Policy 16, 1029–1047. doi:10.1080/14693062.2015.1064344. Also, the following studies also propose how NDCs can be assessed: Kuriyama, A., Tamura, K. and Kuramochi, T. (2019) 'Can Japan enhance its 2030 greenhouse gas emission reduction targets? Assessment of economic and energy-related assumptions in Japan's NDC', Energy Policy, 130, pp. 328–340. doi: 10.1016/j.enpol.2019.03.055.	Noted. Will assess proposed reference.	Takeshi Kuramochi	NewClimate Institute	Germany
46285	15	41	15	41	I would suggest adding two references. 1) Robiou du Pont, Y. et al. Equitable mitigation to achieve the Paris Agreement goals. Nature Climate Change 7, (2017), available at: http://dx.doi.org/10.1038/nclimate3186 . This article was used to justify the ambition of the net-zero emissions target in the UK Committee on Climate Change net-zero report (https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/). Results were used as a basis to downscale ambition assessment at the subnational level for Australian states commissioned by the state government of Victoria, Australia: https://www.climatechange.vic.gov.au/_data/assets/pdf_file/0016/421702/Greenhouse-Gas-Emissions-Budgets-for-Victoria.pdf The article was also used in several litigation cases, including Greenpeace vs. Germany: http://climatecasechart.com/non-us-case/family-farmers-and-greenpeace-germany-v-german-government/ , Carvalho and others vs. the European Union (Doi: 10.1017/S2047102520000072 and http://climatecasechart.com/non-us-case/armando-ferrao-carvalho-and-others-v-the-european-parliament-and-the-council/) 2) Robiou du Pont, Y. et al. Warming assessment of the bottom-up Paris Agreement emissions pledges. Nature Communications 7, (2018), available at: https://doi.org/10.1038/s41467-018-07223-9 . This article combines equity metrics representative of the CBDR-RC in a bottom-up manner that reflects the Paris Agreement architecture.	Noted. Will assess proposed reference.	Yann Robiou du Pont	IDDRI	France
10833	15	42	15	42	Aldy et al. is cited here. In this paper, there are following descriptions; "These are evaluated in the context of three principles for desirable metrics. First, an ideal metric should be comprehensive and thereby characterize a country's entire effort to achieve its mitigation commitment. Second, a metric should be measurable and replicable. That is, different analysts making calculations of the metric should come up with the same values. Third, metrics should be universal – they should be available for a wide range of parties making mitigation commitments". Above three principles of evaluation are worth to mention here.	Noted. This section focuses on fairness in the context of NDCs. Broader equity issues across nations will be discussed in section 4.5. of SOD.	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
13137	15	30	16	2	This section is under-developed. In particular, the section should take account of literature that has assessed the relationship between human rights on the one hand, and fairness and ambition of NDCs on the other, such as Atapattu (2016) and Crosland et al (2016). This relationship is highly relevant in light of the preambular reference to human rights contained in the Paris Agreement.	Noted. Will review proposed reference.	Margaretha Wewerinke-Singh	Leiden University; University of the South Pacific	Netherlands
14711	15	30	16	2	There are several other studies which provide alternative perspectives on assessments of fairness and ambition of NDCs, and the NDC assessment of this chapter would be unbalanced without them. I would also consider it a missed opportunity not to clarify their strengths and limitations. E.g. Robiou du Pont et al (2017)	Noted. Will review proposed reference.	Joeri Rogelj	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
44591	15	30	16	2	It's probably worthwhile to include considerations what equity could mean in the context of very tight remaining global carbon budgets (see, for the Pre-Paris constellation https://iopscience.iop.org/article/10.1088/1748-9326/10/10/105004). In the context of the growing importance of net negative pathways one might think that this simply means that industrialized countries have to go net negative first, creating space for emerging economies and developing countries (see https://link.springer.com/article/10.1007/s10584-019-02368-y). But neither are industrialized countries talking about this, nor is this well reflected in IAMs which often deploy CDR in regions with the highest afforestation and biomass potential, like Latin America (see https://www.nature.com/articles/nclimate3369) There is a little bit of a discussion in ch 3.6.1.2, which hopefully will be expanded. In the context of national or EU pathways there is literature emerging on the need to go beyond/below net zero, and how to implement that politically (see https://www.tandfonline.com/doi/full/10.1080/14693062.2018.1536600). There should be literature emerging for other OECD countries as well	Noted. Will review proposed reference. Note that 4.2.2.5 focuses on fairness in the context of NDCs. Broader equity issues will be discussed in section 4.5 of SOD.	Oliver Geden	German Institute for International and Security Affairs	Germany
16457	15	39	16	2	When using equity as the benchmark of NDCs, the following two papers could be also considered to cite here: Robiou du Pont et al (2017); Equitable mitigation to achieve the Paris Agreement goals; doi: 10.1038/NCLIMATE3186) and Pan et al (2017); Exploring fair and ambitious mitigation contributions under the Paris Agreement goals; doi: http://dx.doi.org/10.1016/j.envsci.2017.04.020).	Noted. Will review proposed references.	Xunzhang Pan	School of Economics and Management, China University of Petroleum, Beijing 102249, China	China
20821	15	14			Period is missing after "capacity building support"	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
9973	16	1	16	2	Different interpretations also entail different sets of principles, e.g. grandfathering vs historical responsibility. - Du Pont, Y. R., Jeffery, M. L., Gütschow, J., Rogelj, J., Christoff, P., & Meinshausen, M. (2017). Equitable mitigation to achieve the Paris Agreement goals. <i>Nature Climate Change</i> , 7(1), 38. - Kartha, S., Athanasiou, T., Caney, S., Cripps, E., Dooley, K., & Dubash, N. K. (2017). Response to Robiou du Pont et al on climate equity. <i>Nature Climate Change</i> . - Du Pont, Y. R., & Meinshausen, M. (2018). Warming assessment of the bottom-up Paris Agreement emissions pledges. <i>Nature communications</i> , 9(1), 4810. - Rogelj, J., & Schleussner, C. F. (2019). Unintentional unfairness when applying new greenhouse gas emissions metrics at country level. <i>Environmental Research Letters</i> , 14(11), 114039.	Noted. Will review proposed reference. Note that 4.2.2.5 focuses on fairness in the context of NDCs. Broader equity issues will be discussed in section 4.5 of SOD.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
16073	16	1	16	2	Is it not worth pointing out that there is no agreed benchmark for equity OR ambition? You do say the first, and that countries put forward their own criteria. But it is worth dwelling on how broadly these can vary, making global comparison very hard. Similarly with ambition; is ambition extent of deviation from BAU, is it a benchmark tied to equity, as in deviation from fair share, further compounding confusion? I think more could be made of the fact that operationalising equity and ambition in NDCs is rendered very hard by this confusion.	Accepted. Text revised.	Navroz Dubash	Centre for Policy Research	India
20825	16	3	16	23	As reading the title of the section 4.2.2.6 "Uncertainty in estimates" I expected to see more about uncertainties in model estimates, such as projection estimates, but this section only addresses uncertainty in relation to possible implementation gap or aggregation. A more detailed discussion on uncertainties will increase the credibility of this chapter as well as the overall AR6 report.	Rejected. Space constraints do not allow going into additional detail. This topic is already covered in part in SR1.5 (cross-chapter box 11).	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
27749	16	5	16	6	This is very unclear	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
24963	16	6	16	6	Replace "have an obligation" with "are expected to"	Accepted. Text to be revised in accordance with wording used in Paris Agreement.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
849	16	6	16	9	Countries are not legally bound to the result of reducing emissions. This is a weakness for mitigation goals and the basis of considerable uncertainty in future emission estimates. It should be the subject of greater discussion in this section of the chapter.	Rejected. Out of scope of Ch4. A statement about the fact that these goals are not legally binding is made in Ch4, but discussing the political economy implications of this fact is not part of Chapter 4.	Michael Kennish	Rutgers University	United States of America
851	16	12	16	13	There is incomplete information in the NDCs. It is necessary to be more specific about what information is missing or incomplete in the NDCs, and why this deficiency will result in uncertain estimates of (near-term) 2030 emission levels. A more thorough explanation is needed in this section of the chapter.	Rejected. The fact that NDC specification is incomplete is stated, and resulting quantitative uncertainties are discussed in this section.	Michael Kennish	Rutgers University	United States of America
37229	16	12	16	23	An additional reference here is Fyson and Jeffery 2018: Ambiguity in the land-use component of mitigation contributions towards the Paris Agreement goals, <i>Earth's Future</i> . This paper looks at the uncertainty in LULUCF mitigation targets in NDCs, and its implications for uncertainty in overall mitigation targets.	Noted. Will assess proposed reference.	Michiel Schaeffer	Climate Analytics	Netherlands
27751	16	18	16	23	This could be advantageously be placed at the beginning of 4.2.2.6	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
24091	17	1	17	30	The figure 1 looks clustered with overlaps. It is recommended that the figure be separated to make the components clearer and more meaningful.	Noted. Given uncertainties in emission inventories and projections, there is little to avoid overlap per se. In order to allow readers to more clearly disentangle the information in Figure 1, the right panel separates out the 2030 ranges for better readability.	Alfred Oforu Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana
27753	17	23	17	23	Cross-Chapter Box 1, Figure 1 is difficult to read	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
41317	17	1	18	29	Potentially relevant paper: Guidance on emissions metrics for nationally determined contributions under the Paris Agreement; by Steve Denison et al 2019 Environ. Res. Lett. 14 124002.	Noted. Will assess proposed reference.	Jan Fuglestedt	CICERO	Norway
2995	17	0			Cross-chapter Box1: Paris agreement is a package and not a mere mitigation. Assessment of gaps with respect to NDCs has also to mention gaps related to other dimensions of the Paris agreement such as adaptation, finance, and capacity building gaps.	Taken into account. As mentioned in the section on "Other gap indicators" as part of cross chapter box 1, a discussion of other metrics have been added for the SOD. While adaptation is mentioned, it is the main focus of the WGII report and will therefore only be covered to a limited extent here.	Mustafa Babiker	Aramco	Saudi Arabia
853	18	4	18	13	The significance of projected emission gaps in 2030 should be addressed.	Accepted. Text revised.	Michael Kennish	Rutgers University	United States of America
10835	18	16	18	16	Please explain briefly the gap between cost-effective emissions pathways reaching temperature goals in the long run and non-cost effective emissions pathways reaching the same goals, because cost-effective emissions pathways are always calculated by assuming global uniform carbon tax which is quite unlikely at least by 2030.	Rejected. Cross-chapter box 1 brings together information from Ch3 and Ch4. It cannot revisit details and definitions of the assessment in those. However, cost-effective emissions pathways will be clearly defined.	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan
15513	18	16	18	24	Consider supplementing the discussion of the "emissions gap" or other "gap indicators" here with the analogous fossil fuel "production gap", as in the SEI, UNEP et al. 2019. The Production Gap Report 2019. http://productiongap.org .	Accepted. Text revised.	Peter Erickson	Stockholm Environment Institute	United States of America
20827	18	16	18	24	Information provided in this part doesn't seem to convey such critical findings, compared to other information provided in Figure 1 or "Emissions gap" in the Box 1. If planning to strengthen "Other 'gap indicators'" discussion, it should contain information (including quantitative information) on a par with "Emissions gap" paragraph.	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20829	18	25	18	29	Similar to the 19th comment, "Adaptation" part should also contain information on a par with other paragraphs in Box 1 if it were to be included in Box 1. However, it seems to me that the link with adaptation would better be addressed and highlighted in a separate box, considering the novelty and significance of the issue.	Taken into account. While adaptation is mentioned, it is the main focus of WG2 report and will therefore be covered here only to a limited extent.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
1259	19	1	19	41	This section should and could be less vague. And it should emphasize more the important role of individuals, companies and organizations in the mitigation process. As already noted in the report further up the current global political landscape will cause a delay for many mitigation options in many countries. In the meantime individuals, companies and organizations will and should step into mitigation much faster and will by that 1. bring us closer to a slow down or decrease in emissions and will 2. speed up mitigation technologies with their money as it will scale up these technologies/methods at all, even when governments are not yet willing/able to fund them. Until the actual finalization of this report more data and studies about actions of individual companies should be available for citing. A number of companies, some notably big (e.g. Microsoft in Jan 2020 or Google in 2019), have recently announced massive investments in climate neutrality and negative emissions, Microsoft even wants to remove all of its company-lifetime-footprint of CO2 from the atmosphere. We can expect more of this and it should be up-to-date in the report because businesses that are faster and more actionable than governments act a role models and can cause others to also follow on this path. https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030/	Accepted. Section 4.2.3 now mentions this point exclusively in the text and in the caption to Figure 4.1	Dirk Paessler	Paessler AG (a 300 people Software Company) and Carbon Drawdown Initiative GmbH (philanthropy/incubator/angel investment company focused on negative emissions)	Germany
32199	19	1	19	41	What about mitigation co-benefits of adaptation actions within NDCs? Have those been considered?	Taken into account. Short paragraph on adaptation component of NDC to be added. However, focus of WG3 is on mitigation. Will point to relevant chapter / section in WG2.	LOKESH CHANDRA DUBE	NATCOM Cell, Ministry of Environment, Forest and Climate Change, Government of India	India
855	19	11	19	20	There is a weak database on mitigation actions by subnational and non-state actors. While the potential impact of these actors may be significant, the limited data compiled and analyzed leaves considerable uncertainty with respect to reduction of GHG emissions. What is the probability of achieving near- and mid-term emissions reduction goals based on such a weak database currently available from individual actors?	Accepted. Section 4.2.3 intends to include best available data at time of writing, and reflect on limitations of this data in text and in confidence statements. These have been added as well as references to two very new 2020 studies, e.g. Hsu et al. 2020 and Liu et al. 2020 and Kuramochi et al. 2020	Michael Kennish	Rutgers University	United States of America
20831	19	13	19	16	Incomplete sentence; a verb is missing	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
44577	19	21	19	21	I think these paragraphs represent a politically unrealistic assessment (prevalent in the literature). It can be expected that the effects of successful non-state, sub-state and transnational mitigation action will be included by state governments in their evaluations of national mitigation, unless it is happening in sectors beyond national UNFCCC inventories (international shipping and aviation) or in nation states that don't pursue a NDC anymore (like the US, if Trump gets elected for a second term), which would make sub-state action "additional". As long as a national government doesn't rule out to account for these kind of actions, it should be expected that these actions don't represent "additional mitigation" in the sense that it comes on top of what the government has pledged. See also the rather cautious assessment in ch13.3.4 on "Performance and global mitigation impact"	Taken into account. Double counting is a major issue with non-state action. Methodology for estimating potential overlaps across non-state action plans and with national plans is mentioned.	Oliver Geden	German Institute for International and Security Affairs	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
28687	19	21	19	35	Suggest adding the following sentence: "Kuramochi et al. (2020) finds that individual commitments by subnational regions, cities and companies in ten high-emitting economies could reduce GHG emissions in 2030 by 1.2 to 2.0 GtCO ₂ e/year compared to current national policies scenario projections (31.6 to 36.8 GtCO ₂ e/year), if they are fully implemented and do not change the pace of action elsewhere." Reference: Kuramochi, T., Roelfsema, M., Hsu, A., Lui, S., Weinfurter, A., Chan, S., Hale, T., Clapper, A., Chang, A., Höhne, N. (forthcoming) Transformation from the bottom-up: potential impact of region, city, and business commitments on global greenhouse gas emissions. Climate Policy. DOI:10.1080/14693062.2020.1740150	Noted. Have added a reference to this. .	Takeshi Kuramochi	NewClimate Institute	Germany
16075	19	30	19	35	This is confusing. The first sentence suggests that NSA are significant to the tune of NDC actions. The second suggests that there may be really serious double counting, which, if true, would undercut the first. This issue of double counting is really important for the discussion of NSA.	Accepted. Text revised. Double counting is a major issue with non-state action. Methodologies for estimating potential overlaps across plans and with national plans to be discussed in depth, and implications for NSA potential reflected in text and confidence statements..	Navroz Dubash	Centre for Policy Research	India
15515	19	33	19	35	The point here about overlap between non-state actors and national actors is important, and is given too little attention in the non-state and sub-national action literature, where GHG emission reductions are often assumed to be "additional" to national pledges or NDCs. Perhaps a better way to think about non-state actor roles is as implementers or enablers, not as entities for which quantification is ever truly considered "additional" to national commitments; for a typology of such possible roles for non-state actors, focused on cities but broadly applicable, see Broekhoff, D., Erickson, P. & Lee, C. M. What cities do best: Piecing together an efficient global climate governance. https://www.sei.org/publications/what-cities-do-best-piecing-together-an-efficient-global-climate-governance/ (2015).	Accepted. Text revised. Double counting is a major issue between non-state action and NDCs. Methodologies for estimating potential overlaps across international cooperative initiatives (ICIs) to be discussed in depth. Additionality and overlap to be clearly distinguished, and implications for NSA potential reflected in text and confidence statements. Also, will review proposed reference.	Peter Erickson	Stockholm Environment Institute	United States of America
10237	19	36	19	36	I would be very cautious about putting such statements into a highly reputable report like AR6. One should never simply add up emissions reductions of a large variety of measures, as there are always very significant overlaps between policies. Reviewing the list provided in Table 4.3 a lot of policies would have doublecounted the reductions, besides when the emissions reductions estimates are pulled from a variety of sources, the calculation methods are not consistent, especially when it concerns policies targeting electricity consumption. Majority of these measures are likely voluntary and are not legislated. Putting such a statement in a report, may sound to some readers, as if we have already almost achieved what is needed (1.8degree!!), and so could get used by politicians or fossil fuel corporations to lobby against climate change mitigation measures.	Accepted. Text revised. Double counting is a major issue between non-state action and NDCs. Methodologies for estimating potential overlaps across international cooperative initiatives (ICIs) are not explicitly discussed.	Aglaia Obrekht	Environment and Climate Change Canada	Canada
24463	19	36	19	41	The conclusion made is problematic on two counts i)there is a big difference between commitments and goals. Most of the actions mentioned in Table 4.3 are stated goals ii) Many of these goals will be realised only if there are national policies that back these goals and if the national policies are in place then they are also part of NDC. For example GFEI mentions a LDV fuel efficiency improvement and within NDC of a few countries we also have the same action	Accepted. Have clarified text.	Subash Dhar	UNEP DTU Partnership, DTU	Denmark
30157	19	36	19	41	The problem with this is that the studies on which this paragraph is based use assumptions about scaling up collaborative initiatives that have not yet materialised. The Emissions Gap Report 2018 in chapter 5 made a clear distinction between initiatives for which specific commitments apply and initiatives for which scaling up was assumed. The former category only added up to less than 0.5GtCO ₂ e reduction over and above what NDCs already should deliver (see figure 5.2 of EGRR 2018). This gives a much more sober assessment of the potential of non-state action. It is essential that the chapter covers this perspective in order to provide the necessary context to the assessment of other studies that assume broad scaling up.	Accepted. Have clarified text.	Bert Metz	European Climate Foundation	Netherlands
16077	19	38	19	39	These may need to be unpacked. My understanding of a lot of the NSA is that they have goals for how many cities they want to sign up, how many companies etc. not just how many they have already signed up. Naturally the former leads to a much larger number than the latter. It is not clear whether "full implementation" is the former or latter in this sentence. Similarly with double counting as already noted. I think it would be worth exploring this in more detail. I note we also look at some of the same material (also with Angel as a CA!) in Ch 13 in our section on sub national action (although this does not include voluntary industry action). We need to coordinate!	Accepted. Having goals for membership is a separate challenge from existing members implementing and achieving stated targets. Will clarify that estimated emission reductions are contingent on assumptions, including about membership. The point about additionality is raised by several reviewers and will be addressed	Navroz Dubash	Centre for Policy Research	India
35865	19	38	19	41	Very contradictory statement to most available research even IPCC special report on 1.5.	Noted. Will look into statement on non-state action in SR1.5.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
15517	19	36	26	21	I strongly encourage you not to add up the estimates of emission reductions in Table 4.3 and to cut Figure 4.1. It is so entirely unclear that these efforts, most of which are voluntary, are additive, that it is potentially very misleading to claim that they could come anywhere near a 2 degree C pathway. Doing so gives a very false sense of optimism and feeds unhelpful narratives that voluntary action by non-state actors could potentially substitute for government-led, nation-led action and governance, whereas there is next to no evidence that they could.	Accepted. Text revised. Double counting is a major issue with non-state action. Methodologies for estimating potential overlaps across plans and with national plans to be discussed in depth, and implications for NSA potential reflected in text and confidence statements. Also, will review proposed reference.	Peter Erickson	Stockholm Environment Institute	United States of America
2997	19	1	27	15	Section 4.2.3: It is unclear whether this be a section of its own or a box/appendix to the chapter for: 1- the Paris agreement and the commitment under NDCs are for countries not parties within countries. 2- Efforts within the country will be reported towards the country obligation not credited separately under the Paris agreement GHGs registry. 3- The scope for double counting is large if these non-state efforts are to be added to the NDCs, i.e. it is not clear if they can be considered additional. 4- Non-state and subnational commitments do not count under the Paris Rule book.	Rejected. The mandate given by the IPCC to Chapter 4 includes discussion of "subnational action plans and policies", as well as NDCs "and other mitigation efforts". In response to part #3 of the comment, the SOD will include in-depth discussion of double-counting risks, and be clear where NSA is additional to NDCs, and where not.	Mustafa Babiker	Aramco	Saudi Arabia
34717	19	1	27	15	Although the subnational policies and non-state actions information is informative, such contents might largely be overlapped with Chapter 13. I would suggest to move information of each policy and action, such as those in Table 4.3, to Chapter 13 so that this Chapter focuses mainly on the collective mitigation effect of these policies like Fig 4.1.	Accepted. Will review overlap with Ch13.	Ken Oshiro	Kyoto University	Japan
20833	19	27			Delete parentheses before and after "Roelfsema et al.2018a"	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
46287	20	1	20	1	The table could cite the ambition assessment at the subnational level for Australian states commissioned by the state government of Victoria, Australia: Meinshausen et al, 2018, Greenhouse gas emissions budgets for Victoria https://www.climatechange.vic.gov.au/_data/assets/pdf_file/0016/421702/Greenhouse-Gas-Emissions-Budgets-for-Victoria.pdf This report is based on the results of Robiou du Pont, Y. et al. Equitable mitigation to achieve the Paris Agreement goals. Nature Climate Change 7, (2017), available at: http://dx.doi.org/10.1038/nclimate3186	Noted. Will assess proposed reference.	Yann Robiou du Pont	IDDR	France
38039	20	42	21	43	I suggest to add a new line in Table 4.3. Sector: Cities and regions Leading Actor: Cities and regions Name: Alliance of Climate-Friendly Municipalities, Hungary Scale: Regional Targets: Local and regional municipalities have variety of targets in their climate change strategies Emissions reduction potential (GtCO ₂ e/year) Min (2030) 0,05 Max (2030) 0,05 Source: Pálvölgyi, T. and D. Esses, 2019. Regional characteristics of greenhouse gas emissions and decarbonization options in Hungary. Deturope – the Central European Journal of Regional Development and Tourism Vol. 11 Issue 3, 93-109 http://www.deturope.eu/img/upload/content_12486531.pdf	Noted. Will assess proposed reference.	Tamás Pálvölgyi	Budapest University of Technology and Economics, Department of Environmental Economics	Hungary
20835	20	42	22		Last two rows* of Table 4.3 presented in page 22 contain identical information except for the source of information. Double check if it's correct information. *Cities and regions /GCoM/ Global/ 1.4 / 1.4	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20837	20	42	24		Second row of Table 4.3 presented in page 24 has negative values for Emission Reduction Potential. What it means to be negative?? Further information in footnote would be helpful.	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
2605	20	1	25	43	This table should include the impact of the WSC initiatives to reduce F-gas emissions from semiconductor manufacture by setting voluntary targets (for 2010 and 2020), namely by the substitution of PFC process gases by less impactful alternatives, and by the widespread adoption of exhaust gas abatement equipment. This has been initiated by the World Semiconductor Council setting voluntary industry targets for 2010 and for 2020 which have been achieved and is set to be achieved respectively. This could be a model for action by other industry bodies in different industrial fields. http://www.semiconductorcouncil.org/wsc/	Noted. Will assess proposed reference.	Michael Czerniak	Atlas Copco - Edwards	United Kingdom (of Great Britain and Northern Ireland)
27495	21		21		Table 4.3 cites the SunShot program with solar electricity at 0.06 per kilowatt-hour and USD 1 per Watt without incentives. These numbers correspond to the SunShot vision that was published in 2012 with a goal to achieve these numbers by 2020. These cost goals were already achieved in 2016, and have been further reduced since. Numbers used in the scenario are, hence, outdated and need to be revised. SunShot has published an updated vision called "SunShot2030". The numbers given here are USD 0.03 per kilowatt-hour in 2030 and USD 0.02 per kilowatt-hour in 2050. (see https://www.nrel.gov/docs/fy17osti/68105.pdf).	Noted. Will assess proposed reference.	Ian Marius Peters	Forschungszentrum Jülich	Germany
17237	22	1	22	1	row "forestry": Please revise numbers. There should be 150 Mio. hectares restored till 2020. We have 2020 - what has been achieved?	Accepted. Numbers to be revised.	Joachim Rock	Thuenen-Institute of Forest Ecosystems	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
45145	22	1	24	1	The scenario references for cities and regions in Table 4.3 may include the most recent mitigation wedge study for cities that is currently identified in Chapter 8 to be "Coalition for Urban Transitions, 2019: Climate Emergency, Urban Opportunity, Coalition of Urban Transitions, World Resources Institute (WRI) Ross Center for Sustainable Cities, and C40 Cities Climate Leadership Group, https://urbantransitions.global/urban-opportunity/ >	Noted. Will assess proposed reference.	Siir Kilikis	The Scientific and Technological Research Council of Turkey	Turkey
12661	22	3			The Agadir Commitment should be added to Forestry Line-Name column (Agadir Commitment includes 8 million hectares restoration for Mediterranean Degraded Forests until 2030)	Noted. Will assess proposed reference.	Eray Özdemir	General directorate of Forestry	Turkey
27755	26	1	26	1	Please check the color for the "current policies" bar on the rhs of the graphic	Editorial – copyedit to be completed prior to publication	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
20839	26	1	26	5	The RHS dots are presented as if they indicate a set of projected emissions level of individual studies. As far as I understand based on Table 4.3 and explanations in text, they are rather indicating emissions reduction potential (from "a" baseline). If this is the case, a baseline must be clearly marked in the figure.	Accepted. Figure to be revised;	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
16079	26	2	26	2	The labelling of "individual commitments" vs. "multiple initiatives" needs more clear explanation.	Accepted. Labeling to be clarified.	Navroz Dubash	Centre for Policy Research	India
20841	26	4	26	5	"Each dot on the RHS represents a study" does not provide sufficient information. Further description about the dots including the baseline used should be added.	Accepted. Labeling to be clarified.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
727	26	6	26	12	this para should be revised to be consistent with and refer to the discussion in Ch. 15 (pg. 41) which includes a discussion on divestment movements and includes references to limited impact of these movements.	Accepted. Will look into Ch15 p41 and revise para accordingly	Christa Clapp	CICERO	Norway
28693	26	9	26	9	LCTPI text also needs references.	Accepted. Text revised.	Takeshi Kuramochi	NewClimate Institute	Germany
24969	26	9	26	10	Delete ", commitments by financial institutions ... from fossil fuels"	Rejected. Rationale for deletion not provided in comment.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
857	26	13	26	21	There are nonbinding pledges by companies to reduce their GHG emissions. It would be much more significant if the pledges were legally binding commitments. There is considerable optimism projected, but the discussion should be tempered by realistic expectations based on acknowledged limitations.	Accepted. Non-binding character of non-state action pledges to be made clear in the text of the section.	Michael Kennish	Rutgers University	United States of America
2607	26	13	26	21	As per Table 4.3, include the impact of the WSC initiatives to reduce F-gas emissions from semiconductor manufacture by setting voluntary targets (for 2010 and 2020), namely by the substitution of PFC process gases by less impactful alternatives, and by the widespread adoption of exhaust gas abatement equipment. This has been initiated by the World Semiconductor Council setting voluntary industry targets for 2010 and for 2020 which have been achieved and is set to be achieved respectively. This could be a model for action by other industry bodies in different industrial fields. http://www.semiconductorcouncil.org/wsc/	Noted. Will assess proposed reference, noting potential for overlap	Michael Czerniak	Atlas Copco - Edwards	United Kingdom (of Great Britain and Northern Ireland)
27757	26	14	26	17	The logic of the second part of the sentence is unclear	Accepted. Text revised	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
28691	26	17	26	18	Requires reference. I believe this is the website: https://sciencebasedtargets.org/companies-taking-action/ (as of 29 February the numbers were 817 companies pledged and 336 with approved SBT.)	Noted. Will assess proposed reference.	Takeshi Kuramochi	NewClimate Institute	Germany
859	26	24	26	25	California and Scotland have established zero emission targets. What steps have been implemented by California and Scotland to actually achieve zero emissions?	Taken into account. Will discuss implementation gap in 4.2.3	Michael Kennish	Rutgers University	United States of America
44923	26	26	26	31	It is worth reflecting on whether a likely contributing factor to the failure to halt deforestation rates may be current UNFCCC approaches to forest definitions and accounting? Failure to distinguish between a primary forest ecosystem, natural wood production forests and mono culture plantations and treating all carbon in these different forest conditions as equal appears to have encouraged parties to partially offset losses of primary (and in some cases secondary natural) forests through expanded mono culture plantations. The result has been catastrophic for Earth's largest and most stable forest carbon stocks. Developing ecosystem stock accounts that reflect differences in ecosystem condition is under active consideration in the UNSEEA framework (Keith, H., Maes, J., Czucz, B., Jackson, B., Driver, A., Bland, L., Nicholson, E. (2019). Discussion paper 2.1: Purpose and role of ecosystem condition accounts. Paper submitted to the SEEA EEA Technical Committee as input to the revision of the technical recommendations in support of the System on Environmental-Economic Accounting. Version 5 September 2019. 50 pp. https://seea.un.org/content/seea-experimental-ecosystem-accounting-revision)	Rejected. Outside of the scope of Ch4. Forest definition and accounting is an issue for Ch7.	Virginia Young	Australian Rainforest Conservation Society, Griffith University, CAN Ecosystems	Australia
11583	26	28	26	28	Could also provide reference to the Bonn Challenge	Noted. Will consider adding reference to Bonn Challenge.	John Devaey	Trinity College Dublin	Ireland
28689	26		26		Following peer-reviewed study to replace NC-Yale-DIE-OX (2019): Kuramochi, T., Roelfsema, M., Hsu, A., Lui, S., Weinfurter, A., Chan, S., Hale, T., Clapper, A., Chang, A., Höhne, N. (forthcoming) Transformation from the bottom-up: potential impact of region, city, and business commitments on global greenhouse gas emissions. Climate Policy. DOI:10.1080/14693062.2020.1740150	Noted. Will assess proposed reference.	Takeshi Kuramochi	NewClimate Institute	Germany
4983	26	1	27	39	How are these global trends compatible if there is uncontrollable deforestation in the Amazon to replace it with planted areas?	Accepted. Will review text of 4.2.3 based on description of NSA in Ch7.	MARIA DEL VALLE MORRESI	UNIVERSITY	Argentina
37251	27	1	27	2	Quantification of reductions referred here would be useful in making a case initiatives that would enhance action focused on non-CO2 emissions.	Accepted, text revised	Michiel Schaeffer	Climate Analytics	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
37253	27	2	27	3	not sure what does this sentence achieves. It is stating the obvious. Delete	Accepted. Text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
7019	27	11	27	13	You mention several "hard to abate" sectors, and refer to chapters 9 & 10. Are you sure you don't mean 10 (Transport) & 11 (Industry)? Steel & cement are covered in Ch11, Industry, and we are avoiding using the "hard to abate" language because there are known technical options for going to very low and zero emissions in these sectors. The challenge is policy to accelerate commercialization and policies to drive takeup. Finally, several steel compaies have pledged to go to zero in certain jurisdictions, e.g. Arcelor Mital has pledged to go to net-zero in the EU. Sources: Bataille, C. 2020. Physical and policy pathways to net-zero emissions industry. WIRES Climate Change. 2020;11:e633. https://doi.org/10.1002/wcc.633 Bataille, C. 2019. Low and zero emissions in the steel and cement industries: Barriers, technologies and policies. OECD Green Growth and Sustainable Development Forum. https://www.oecd-ilibrary.org/environment/low-and-zero-emissions-in-the-steel-and-cement-industries_5ccf8e33-en	Accepted, text revised	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNVIERSITY	Canada
28213	27	11	27	13	See DHL commitment towards zero emisison: https://www.dphl.com/en/responsibility/environment-and-solutions.html or Maersk commitment https://www.maersk.com/news/articles/2019/06/26/towards-a-zero-carbon-future . Both are key actors on freight transport	Noted. Will assess proposed reference.	Cornie Huizenga	CESG	Germany
27759	27	14	27	14	"diverse meanings"? Do you perhaps mean: "under diverse names: ..."?	Accepted. Text revised	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
46289	27	16	27	16	Section 4.2.4 should include a section on the fairness and ambition of 'mid-century low emission development strategies'. As NDCs, mid-century targets can be assessed on the basis of available scientific studies. Many of the references used in section 4.2.2.5 can help with such ambition assessment. In particular, the following references provide long-term equity trajectories that are consistent with cost-optimal global emissions scenarios: Robiou du Pont, Y. et al. Equitable mitigation to achieve the Paris Agreement goals. Nature Climate Change 7, (2017), available at: http://dx.doi.org/10.1038/nclimate3186 . Robiou du Pont, Y. et al. Warming assessment of the bottom-up Paris Agreement emissions pledges. Nature Communications 7, (2018), available at: https://doi.org/10.1038/s41467-018-07223-9 . Holz, C., Kartha, S., & Athanasiou, T. (2017). Fairly sharing 1.5: national fair shares of a 1.5 °C-compliant global mitigation effort. International Environmental Agreements: Politics, Law and Economics, 18(1), 117–134. https://doi.org/10.1007/s10784-017-9371-z Pan, X., Teng, F., Tian, Y., & Wang, G. (2015). Countries' emission allowances towards the low-carbon world: A consistent study. Applied Energy, 155(October), 218–228. https://doi.org/10.1016/j.apenergy.2015.06.011	Rejected. There is limited literature on fairness and ambition of mid-century strategies (contrary to NDCs). General discussion of equity is located in section 4.5. Can add brief indication of equity implications, taken into account in reponse to comment 30163	Yann Robiou du Pont	IDDRI	France
20843	27	18	27	19	Section numbers should be corrected. i) UNFCCC -> Section 4.2.4.2 ii) academic work -> the same number "4.2.4.4" is repeated.	Accepted, text revised	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20845	27	29	27	36	Currently, section 4.2.4.2 simply summarizes numbers and official information on LT-LEDs. Further examination and discussion on this matter are expected in the SOD.	Accepted, text revised to include discussion.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
30159	27	30	27	36	It should be stressed that many of the 2050 targets in the LEDS are inconsistent with meeting the Paris temperature goals	Rejected. (1) We have found limited peer-reviewed literature on LEDS. (2) Global temperature is a function of global emissions, over a long period of time. Yet only a limited set of countries have established LEDS, so it is not possible to compute the global consequences of LEDS. (3) And linking individual country trajectories to global temperatuer goals is not feasible because it depends on assumptions about what other countries do.	Bert Metz	European Climate Foundation	Netherlands
37257	27	34	27	35	Note Fiji, MI & Portugal have "net"zero, NOT zero targets.	Accepted, text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
10239	27	37	27	39	Canadian government announced that it will be updating its 2050 target to netzero by 2050. Details to come.	Noted. The latest available information will be used in SOD.	Aglaia Obrekht	Environment and Climate Change Canada	Canada
37255	27	33	28	37	statement & table 4.4: change the statement to be factually correct - five countries cannot be classified as "many".	Accepted, text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
20847	27	37	28	1	(Update) Costa Rica submitted its LEDS in December 2019. Even in final version of Ch.4, a summary of LEDS of each Party as in Table 4.4 will be very informative.	Noted. The latest available information will be used in SOD.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
44179	27	37	28	1	UK now has a legislated net-zero GHG target for 2050. Please update.	Noted. The latest available information will be used in SOD.	Ajay Gambhir	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
44579	27	37	28	1	If you keep the table, you should indeed use the latest version of the UNFCCC LTS table. The US LTS should at least be marked as potentially invalid if the US wouldn't be part of the Paris Agreement anymore, and in the case of the EU it is unclear if "old" Member State NDCs which were submitted under the common EU target of 80-95% by 2050 make much sense anymore. The EU now submitted a "net zero by 2050" LTS, which will subsequently lead to new Member State strategies, but not necessarily before the end of 2020 (btw., Germany didn't promise GHG neutrality in its LTS, it just considered -95% to be 'almost GHG neutral', there was always some kind of ambiguity involved). To avoid some of these problems, it might be preferable to substitute the reproduction of the UNFCCC table with (hopefully) emerging analyses on LTS submitted to the UNFCCC	Noted. The latest available information will be used in SOD.	Oliver Geden	German Institute for International and Security Affairs	Germany
10837	27		28		UK's strategy in Table 4.4.1 is out-of-date. The Government changed its goal to reach net zero emission by 2050 in June 2019. Please check	Noted. The latest available information will be used in SOD.	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan
24971	27		28		Table 4.4 should be updated to reflect announcements made at the UN Climate Summit and the EU's New Green Deal	Noted. The latest available information will be used in SOD.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
37259	28	10	28	13	The long term mitigation scenarios (2007) are outdated. Government now using the more recent, Mitigation Potential Analysis (2014), which is far more detailed.	Noted. The proposed reference	Michiel Schaeffer	Climate Analytics	Netherlands
24973	28	16	28	17	Refer to the SR1.5	Rejected. SR1.5 has already been referred to.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
30161	28	17	28	17	should be "bnet zero CO2"	Accepted. Text revised	Bert Metz	European Climate Foundation	Netherlands
30163	28	18	28	20	It should be clarified that this approach does not allow for giving poor countries more time to reach net zero CO2 and that therefore rich countries should meet that point earlier than 2050. This is an essential consideration for equitable and fair policy making.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
861	28	20	28	22	"...neither assumption is likely to hold in reality but is useful for modeling." How accurate are the models if these assumptions do not hold? This should be clarified.	Accepted. Text revised.	Michael Kennish	Rutgers University	United States of America
30165	28	22	28	23	without a comparison to what is needed for meeting the Paris goals (or selecting only those pathways that countries consider Paris compatible), this is not very useful. What are countries considering pathways that are Paris compatible? And how do they justify this?	Rejected. One cannot link individual national plans (in this case, aspirational) to agreed temperature limits, the respect of which depends on global emissions, over a longer period of time, without making additional assumptions about equity (what do other countries do) as well as about the future (how do emissions, of that particular country and of others, evolve beyond 2050).	Bert Metz	European Climate Foundation	Netherlands
45575	29	1	29	1	the circular and square black dots don't match	Editorial – copyedit to be completed prior to publication	Daniel Crow	International Energy Agency	France
28695	29	1	29	5	On Figure 4.2: What is done in the UNEP Emissions Gap Report might be helpful in clarifying this figure, and I'm happy to provide support. Some ideas and suggestions below: Scenarios: The current categorisation may be a bit confusing. For example, it is not clear what "COe emissions with mitigation" means - does it represent current policy scenarios (with varying policy cut-off dates) ? or something else? I propose the following categorisation as one idea (partially based on Kuramochi et al. (2017): http://dx.doi.org/10.1016/j.rser.2016.12.093): 1. no policy baseline: it might be useful to be explicit about policy cut-off date (e.g. no policies assumed after 2005 or 2010). 2. Current policy trajectory: "This trajectory is based on estimates of 2020/30 emissions considering projected economic trends and current policy approaches including policies at least through 201X. Estimates may be based on either official data or independent analysis." (as per UNEP gap report definition) 3. Additional policy scenario: includes all types of enhanced policy scenarios that do not explicitly say that they are consistent with Paris/1.5/well below 2C. 4. Paris Agreement- (or 1.5C- /well below 2C-)consistent scenario: include all studies that self-claim as such. Emissions coverage: - It would be important to present all GHGs, especially when in comparison with NDCs. - For some countries (not only Brazil and Indonesia but also e.g. Russia & USA where large sink is expected) it would be important to include LULUCF, which seems to be excluded here, especially when in comparison with NDCs. In the UNEP gap report, for studies without LULUCF projections we assumed constant emission levels as in the last historical data year (except large LULUCF emitting countries). - Harmonisation of GWPs may also be needed.	Accepted. Figure to be revised. Proposed reference noted, will be assessed.	Takeshi Kuramochi	NewClimate Institute	Germany
44581	29	1	29	5	Not sure if you should really go with these CO2 trajectories which is confusing for climate policymakers because they are used to GHG targets, which makes an enormous difference when it comes to net zero trajectories	Noted. However, lack of available data may make it necessary to limit analysis to CO2.	Oliver Geden	German Institute for International and Security Affairs	Germany

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16081	29	2	29	2	Figure: The label "CO2 emissions without policy" is misleading. Surely there is some policy in all countries. The question is whether this is 'current' policy, ie pre NDC, or is it current (circa 2019) policy? And is this definition consistent across countries? Needs clarifying.	Accepted. Text revised.	Navroz Dubash	Centre for Policy Research	India
24465	29	2	29	5	Without relating the CO2 emissions to the stage of development in Figure 4.2 can be problematic. In this figure the transition in terms of per capita emissions also needs to be shown	Noted. Figure to be revised. However, 'stage of development' is a contested concept and not necessarily represented by emissions per capita (could be cumulative, per GDP, or a range of proxies for equity)	Subash Dhar	UNEP DTU Partnership, DTU	Denmark
863	29	6	29	14	It is unrealistic to assume that these extreme emission reductions can be achieved in 10 to 30 years. It is necessary to discuss both the strengths and weaknesses of the technology and other measures being applied in each of these countries to determine the probability of achieving 1.5°C or 2°C temperature scenarios.	Taken into account. Scenarios in this paragraph to be discussed and not just described. On the other hand, one cannot link individual national plans (in this case, aspirational) to agreed temperature limits, the respect of which depends on global emissions, over a longer period of time, without making additional assumptions about equity (what do other countries do) as well as about the future (how do emissions, of that particular country and of others, evolve beyond 2050).	Michael Kennish	Rutgers University	United States of America
30167	29	7	29	7	In light of equity considerations a country like Japan should meet the net zero CO2 point BEFORE 2050	Noted.	Bert Metz	European Climate Foundation	Netherlands
30169	29	7	29	14	Expected further discussion on Japan, but this text apparently addresses other Countries (China, Germany) and more overall issues. That is confusing.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
20851	29	11	29	12	Delete parentheses for references	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
30171	29	18	29	22	Again, text on India is combined with more general observations, which is confusing. The issue of all GHG net zero deserves a separate discussion, as it applies to all countries. Net zero GHGs by 2070 are compatible with 1.5C and a later date applies to WB2C. In light of equity rich countries should aim for net zero GHG by 2050, just like the EU has decided.	Accepted, text revised.	Bert Metz	European Climate Foundation	Netherlands
18541	29	23	29	23	Several up to date lists of net zero commitments are available on the internet, including one from https://www.nature.com/articles/d41586-020-00571-x . List is available at https://newclimate.org/ambitiousactions	Noted. Will assess proposed reference.	Niklas Höhne	NewClimate Institute	Germany
34805	29		29		Fig 4.2 on CO2 emission looks good and the trends of the emission over the years is coherent. However, adding an African country will make the CO2 emission trend more global and consistent.	Noted. Will expand number of countries depending on data availability.	Onema Adojoh	Missouri University of Science and Technology, Rolla, USA	United States of America
20849	29	1			Is the NDC conditional target marked in any of the 9 graphs? The color of triangles are too similar to distinguish between NDC unconditional target and conditional target. More apparent distinction will be helpful.	Taken into account. Conditional and unconditional targets are not legal requirements, but literature reflects them, with researchers making assumptions. This is treated in the cross-chapter box	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
34719	29	1			In Figure 4.2, the mitigation scenarios should have more detailed subcategories, such as the NDC-extended, NDC-MCS, immediate-MCS, etc. In the current form, in some countries there are critical overlapping between the NoPolicy and the mitigation scenarios.	Taken into account. Figure to be revised depending on available data.	Ken Oshiro	Kyoto University	Japan
34731	29	1			I guess a number of national scenario will be submitted between the FOD and SOD, thus Fig 4.1 will become very complicated to interpret. In this regard, I would suggest to choose one or two illustrative scenarios for each region and summarize the key indicators in terms of energy and land-use implications, like the P1-P5 scenarios in the SR1.5.	Taken into account. Figure to be revised depending on available data.	Ken Oshiro	Kyoto University	Japan
865	30	1	30	14	Are these natural targets for zero net GHG emissions by 2050 (contained in laws, strategies, or other communications) binding commitments? Are they legally binding? If so, please state it.	Accepted. Legal nature of mid-century targets to be clarified.	Michael Kennish	Rutgers University	United States of America
20853	30	1	30	15	This could be summarized in a table similar to Table 4.4	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
44583	30	3	30	15	Since there's much confusion about net-zero CO2 (geophysical requirement) and net zero GHG (Art 4 Paris Agreement mitigation targets, and often also the reference point for national targets) you should always explicitly mark what net-zero refers to. As far as I know, France has a net-zero GHG target (not CO2) only, UK has a net zero GHG target. The EU now has a 'common' net zero GHG target as well, which doesn't mean all Member States have to be net zero in 2050 (European Council Conclusion, Dec 12 2019). But New Zealand only has a net-zero target for long-lived GHGs, including N2O but excluding biogenic methane, which has its own mitigation trajectory. Maybe it makes sense to create an overview of national net zero targets, but in this case you should only highlight "credible" targets (and you would need criteria for that) and information whether these include international aviation and shipping, or if use of international offsets is allowed	Accepted. Text revised.	Oliver Geden	German Institute for International and Security Affairs	Germany
13369	30	12	30	12	Update: The EU Commission has now proposed a climate law enshrining the 2050 net zero target into law	Accepted. Text revised	Adam Pawloff	Greenpeace	Austria
20855	30	16	30	25	This paragraph seems to be out of place. It doesn't fit in with other contents in section 4.2.4.3.	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
30173	30	16	30	25	This should be put in a separate section. It does not belong here.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
44181	30	16	30	25	Entire paragraph looks out of place. Should be in Chapter 3, which discusses scenarios and narratives.	Accepted. Text revised.	Ajay Gambhir	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
46395	30	16	30	25	This is a strange paragraph, that suddenly appear in the text. It is of course relevant to write about qualitative scenarios (in this context one could perhaps make reference to Beck & Mahony, Nature Clim Change 7, 311 (2017) and Carlsen et al., Nat Clim Change 7, 613 (2019)), but it should be better positioned in the chapter, and perhaps have a more prominent role. The ref. to Schweizer & kriegler (2012) is strange. This paper is about SRES.	Accepted. Text revised.	Henrik Carlsen	Stockholm Environment Institute	Sweden
7021	30	30	30	32	Suggest replacing "DDPP (Deep Decarbonization Pathways Project) consists of 16 countries, and participated institutes in each country used their own models to estimate the deep decarbonisation pathways from the viewpoint of each country's perspective (Waisman et al. 2019).: with "The first phase of the Deep Decarbonization Pathways Project consisted of 16 countries representing 74% of global CO2 emissions (Bataille et al 2016), and built a composite picture of a global pathway compliant with a 50% change of 2C according to scenarios in AR5. Participating institutes from each country used their own models to estimate deep decarbonization pathways building from each country's physical, social, cultural and economic perspective (Waisman et al 2019). Another DDP has been completed for 6 Latin American countries (Bataille et al 2020), and a DDP Africa was underway at time of writing." Source: Bataille, C., H. Waisman, A. Vogt Schilb, M. Jaramillo, R. Delgado, R. Arguello, L. Clarke, T. Wild, F. Lallana, G. Bravo, G. LeTreut, G. Nadal, G. Godínez, J. Quiros-Tortos, E. Pereira, M. Howells, D. Buira, J. Tovilla, J. Farbes, R. Jones, D. De La Torre Ugarte, M. Collado, F. Requejo, X. Gomez, R.Soria, D. Villamar, P. Rochedo, M. Imperio, Y. Briand, J. Svensson. 2020. Net-zero deep decarbonization pathways in Latin America: challenges and opportunities. Energy Strategy Reviews. Submitted and under review.	Accepted. Text will be revised. Proposed reference noted, to be assessed.	CHRISTOPHER BATAILLE	IDDR.ORG/SIMON FRASER UNVIERSITY	Canada
20857	30	26	31	20		Accepted. Distinction between multi-model and multi-country analysis to be made. Figure 4.2. to be updated, data permitting.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
34721	30	26	31	20	The MILES project can be mentioned here. https://www.iddri.org/en/project/modelling-and-informing-low-emission-strategies And here is the related paper which represents the MILES national scenarios for major economies. Fragkos et al. https://doi.org/10.1016/j.enpol.2018.04.002	Noted. Will assess proposed reference.	Ken Oshiro	Kyoto University	Japan
34723	30	26	31	20	It might be useful to include summary of the contents of each project, such as the policy scenario covered, country list, etc. Annex C looks also suitable place to include such information, as well as the global model based projects.	Accepted. Description of project to be included in Annex C	Ken Oshiro	Kyoto University	Japan
30175	30	27	31	20	It is not useful just to list multi-model studies. The only relevant way to use this information is to draw relevant conclusions from each of these studies for the earlier and later sections	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
20859	31	6	31	8	Is it intended to only introduce individual studies on USA and Japan here? Otherwise, are they under a project (probably without a name) like other examples in section 4.2.4.4?	Rejected. List is by study, not by country.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
28697	31	21	31	21	[May fit better in other sections of this chapter] It is important to mention that while 1.5C-consistent emission pathways would look even more difficult, if not equally, to achieve when they are scaled down to (sub-)sector level benchmarks, it is also worth noting that there are examples of 1.5C-consistent actions emerging in some parts of the world. Suggested reference: Kuramochi, T., Höhne, N., Schaeffer, M., Cantzler, J., Hare, B., Deng, Y., Sterl, S., Hagemann, M., Rocha, M., Yanguas-Parra, P.A., Mir, G.-U.-R., Wong, L., El-Laboudy, T., Wouters, K., Deryng, D., Blok, K., 2017. Ten key short-term sectoral benchmarks to limit warming to 1.5°C. Clim. Policy 18 (3), 287–305. https://doi.org/10.1080/14693062.2017.1397495495	Noted. Examples of mitigation action being implemented at various scale are already given in Ch4. On the other hand, one cannot link individual national plans (in this case, aspirational) to agreed temperature limits, the respect of which depends on global emissions, over a longer period of time, without making additional assumptions about equity (what do other countries do) as well as about the future (how do emissions, of that particular country and of others, evolve beyond 2050).	Takeshi Kuramochi	NewClimate Institute	Germany
30177	31	24	31	33	The idea was that chapter 3 would cover those lessons. Then do not repeat them here. This section can be deleted.	Rejected. Handshake with Ch3 necessary here. Will coordinate w/Ch3 to avoid overlaps.	Bert Metz	European Climate Foundation	Netherlands
867	31	25	31	29	GHG emissions have been increasing by more than 2% a year. It is overly optimistic that global energy-related carbon emissions will peak by 2020 and even less optimistic that they will fall by more than 70% during the next 30 years. Cutting industry CO2 emissions by 65-90% from the 2020 level by 2050 is unlikely. The problem is a matter of probability and the fact that the wheels of societal change turn too slowly to meet the necessary steep trajectories of cuts in carbon energy use. There needs to be an objective discussion in section 4.2.5.1 of the probability that GHG emission reduction goals will be reached by 2030 or 2050.	Taken into account. Less ambitious mitigation scenarios must also be discussed in 4.2.5. On the other hand, it is beyond the scope of Ch4 to ascribe probabilities.	Michael Kennish	Rutgers University	United States of America
24093	31	26	31	26	Replace "needed to limit global temperature increase" with "needed immediately or within the shortest possible time, to limit global temperature increase"	Rejected. Sentence already mentions "rapid" emission reductions.	Alfred Ofosu Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana
18495	31	34	31	34	need to define what it means: Transformative technological and institutional changes	Accepted. Text revised.	Jiahua Pan	Chinese Academy of Social Science	China
30179	31	34	31	43	This can be moved to next section on Country and Regional pathways	Taken into account. P.31, lines 34-39 are general lessons derived from global models. Lines 40-43 on the other hand, are country specific and may be moved.	Bert Metz	European Climate Foundation	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
32313	31	39	31	40	One missing paragraph must be inserted between line 39 (after : ... projected for many countries with low renewable penetration today.) and line 40 (before : ...Countries/states that have made ...) : ADD : Some analyses result in a large role for nuclear energy in mitigation of GHGs (Hong et al., 2015; Berger et al., 2017a, 2017b; Xiao and Jiang, 2017)	Noted. Will assess proposed reference.	Jean-Luc SALANAVE	Ecole Centrale-Supelec, Paris, France (professor, energy systems)	France
20861	31	40	31	42	Section 4.2.3 does not seem to have any relevant information on rapid progress in renewable energy use or RE targets.	Accepted. Text revised	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
27761	31	42	31	43	"Thus, an important component of rapid decarbonisation of the power sectors is illustrated in Figure 4.3." e.g., as shown in Figure 4.3., renewable electricity generation is planned to increase rapidly."	Accepted. Text revised.	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
25835	31	1	32	40	It might be worth treating hydro separately, especially since it has substantial CH4 emissions associated with it. Ocko, Ilissa B., and Steven P. Hamburg. "Climate Impacts of Hydropower: Enormous Differences among Facilities and over Time." Environmental Science & Technology 53, no. 23 (December 3, 2019): 14070–82. https://doi.org/10.1021/acs.est.9b05083 .	Rejected. Outside of the scope of Ch4. Detailed treatment of energy sources is proposed in Ch6 (energy systems)	Jonathan Buonocore	Harvard University	United States of America
34725	31	21	33	17	Though I understand that it is still the FOD and this section seems still paper-reviewing stage, some additional items needs to be added to support these sentences. Particularly, it would be helpful to summarize quantitative results on key energy indicators (e.g. Renewable share in PES and Electricity, energy efficiency, share of low carbon carriers in FEC) based on the submitted national scenarios to the AR6 database.	Noted. Awaiting more data from the national scenario database being compiled for IPCC AR6 WGIII	Ken Oshiro	Kyoto University	Japan
34727	31	21	33	17	AFOLU implications are lacking while it would be important especially in the 1.5deg-C scenarios in some countries.	Accepted. Will conduct more literature review on this topic, also referring to ch 7.	Ken Oshiro	Kyoto University	Japan
10839	31	21	37		Here the draft discusses on what is to be done to accelerate mitigation. This is helpful for policymakers or persons concerned to some extent. However without cost indication (both impact to GDP and MAC), policymakers cannot decide to what extent they should follow recommendations discussed here. Cost information can be obtained from literatures, and this is indispensable.	Taken into account. Will conduct more literature review on costs.	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan
39215	31	21	42	12	Mention of the land use sector is surprisingly missing! In particular for developing region (Asia, Latin America, Africa) where LUC emissions cover a large (if not the majority) of CO2 emissions.	Accepted. Will conduct more literature review on this topic.	Diego Silva Herran	National Institute for Environmental Studies	Japan
39217	31	21	42	12	Add mention of the role of enhancing carbon sinks through reforestation/afforestation, protection of natural forests, and improved agricultural practices in the context of national mitigation.	Accepted. Will conduct more literature review on this topic.	Diego Silva Herran	National Institute for Environmental Studies	Japan
32201	32	1	32	1	Fig 4.3: Why Scotland and California are shown? These are sub-national entities. rather these should be shown as UK and USA respectively. There are sub-national entities elsewhere as well which have not been shown in the graph.	Accepted. Mix of national and subnational actors to be explained.	LOKESH CHANDRA DUBE	NATCOM Cell, Ministry of Environment, Forest and Climate Change, Government of India	India
45577	32	1	32	1	this figure is a nightmare to read! Pls simplify and interpret the key messages	Accepted. Figure revised.	Daniel Crow	International Energy Agency	France
10241	32	1	32	2	What is meant by 'renewable' here? Does it include hydro?	Accepted, text revised.	Aglaja Obrekht	Environment and Climate Change Canada	Canada
28699	32	1	32	6	On Figure 4.3: On the scenario categorisation, the same suggestions regarding emission scenarios also apply here - mitigation scenarios can be further broken down into sub-categories. Also, it might make the figure more clearer if the global figure and country specific figures are separated.	Taken into account. Figure 4.3 to be improved to ensure better communication. Scenario categorisation will depend on data.	Takeshi Kuramochi	NewClimate Institute	Germany
869	32	7	32	7	Are the timelines for these mitigation pathways consistent with achieving a 2°C temperature scenario?	Rejected. One cannot link individual national plans (in this case, aspirational) to agreed temperature limits, the respect of which depends on global emissions, over a longer period of time, without making additional assumptions about equity (what do other countries do) as well as about the future (how do emissions, of that particular country and of others, evolve beyond 2050).	Michael Kennish	Rutgers University	United States of America
30183	32	7	32	7	be careful not to mix up 2C and WB2C! ; "towards 2C" is too vague.	Rejected. One cannot link individual national plans (in this case, aspirational) to agreed temperature limits, the respect of which depends on global emissions, over a longer period of time, without making additional assumptions about equity (what do other countries do) as well as about the future (how do emissions, of that particular country and of others, evolve beyond 2050).	Bert Metz	European Climate Foundation	Netherlands
20865	32	10	32	11	References should be provided for the statement "several studies emphasize industry and transport actions" as in the third and the fourth sentences.	Accepted, text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
19871	32	12	32	13	"Cleaner fuels, particularly, renewable, non-fossil and some biofuels" should be changed to "cleaner fuels, particularly renewable, nuclear and some biofuels." Various low carbon scenarios suggest that nuclear is one of the means for decarbonization and avoiding reference to nuclear is not logical.	Taken into account, will conduct more literature review on nuclear	Takahiko Tagami	Institute of Energy Economics, Japan	Japan
30499	32	18	32	18	This seems misleading. The mitigation potential of behaviour change is receiving increasing attention. Even the SR1.5C included the figure of 1/5th of emissions for an under 2C scenario could come from diet. This deserves far more coverage for policy makers to consider, and the wider implications are healthy too (shifts to more sustainable agriculture, etc).	Accepted, more detailed literature and links to IPCC SRCCL, SR1.5 and Ch5 to be added.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
30181	32		32		A similar graph of zero carbon energy (including nuclear) would also be relevant. Maybe even combine 100% renewable and zero carbon in the same graph.	Noted. Will improve Figure 4.3. based on data availability	Bert Metz	European Climate Foundation	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
20867	32	7	33	17	The whole text seem to be out of place. They seem to be a literature review summarizing mitigation strategies included in country and regional pathways, which is also presented in Table 4.5. It doesn't fit in section 4.2.5.1."Lessons from global mitigation pathways". If it was intentionally added to 4.2.5.1, then add some context prior to it.	Accepted, section to be revised and text adjusted	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
27905	32	7	40	8	Two papers that address the pace of transition needed to avoid 1.5 C global warming (80% transition to renewables by 2030 and 100% by 2050) for 143 and 139 countries, respectively, are Jacobson, M.Z., M.A. Delucchi, M.A. Cameron, S.J. Coughlin, C. Hay, I.P. Manogaran, Y. Shu, and A.-K. von Krauland, Impacts of Green New Deal energy plans on grid stability, costs, jobs, health, and climate in 143 countries, One Earth, 1, 449-463, doi:10.1016/j.oneear.2019.12.003, 2019. https://web.stanford.edu/group/efmh/jacobson/Articles/I/WWS-50-USState-plans.html and 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, https://web.stanford.edu/group/efmh/jacobson/Articles/I/WWS-50-USState-plans.html . Here is a graph showing the timeline of the transition from the 143-country paper https://web.stanford.edu/group/efmh/jacobson/Articles/I/TimelineDetailed.pdf	Noted. Will assess proposed reference.	Mark Jacobson	Stanford University	United States of America
20863	32	2			The title of Figure 4.3 [targets for the share renewables] -> [targets for the share of renewables]	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
10841	33	1	33	2	I don't understand why at global scale, 1.5 scenarios have focused on Asia (India, Japan, China and Beijing City) by looking at Table 4.5. Please explain clearly the reason. Also it is well known China and later India and several large developing countries' emissions are growing. Why we focus on these fact only on 1.5 degree goal and not on 2 degree goal. To mention one city name is quite improper without mentioning particular reasons. Delete Japan from here or clearly explain why.	Accepted, text revised.	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan
16083	33	1	33	2	Is some discussion needed of the fact that 1.5 scenarios make some implicit burden sharing assumption when they result in national or sub-national or even sectoral projections. They tend to assume a uniform level of stringency of action rather than some differentiated stringency.	Accepted. In fact, one cannot link individual national plans (in this case, aspirational) to agreed temperature limits, the respect of which depends on global emissions, over a longer period of time, without making additional assumptions about equity (what do other countries do) as well as about the future (how do emissions, of that particular country and of others, evolve beyond 2050).	Navroz Dubash	Centre for Policy Research	India
871	33	1	33	17	Are the timelines for these mitigation pathways consistent with achieving a 1.5°C temperature scenario?	Rejected. One cannot link individual national plans (in this case, aspirational) to agreed temperature limits, the respect of which depends on global emissions, over a longer period of time, without making additional assumptions about equity (what do other countries do) as well as about the future (how do emissions, of that particular country and of others, evolve beyond 2050).	Michael Kennish	Rutgers University	United States of America
30185	33	1	33	17	This section is about Asia and should therefore be moved to 4.2.5.2	Accepted, text revised.	Bert Metz	European Climate Foundation	Netherlands
44585	33	3	33	5	Unclear what the mention of CCS means here. Maybe just delete it to avoid the impression that CCS as such is a removal technology	Accepted, text revised.	Oliver Geden	German Institute for International and Security Affairs	Germany
30501	33	15	33	15	Transforming human behaviour through government regulation should be included in this list; governments have a responsibility to protect their citizens, and some behaviour aspects, if driving GHG emissions on a luxury etc basis, could be regulated to save lives of those most vulnerable.	Accepted, will conduct more literature review on this topic, and also link to Ch5 which focuses on behaviours	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
46397	33	23	33	24	What does 'systems analysis' entail here? This is more an approach/method to me.	Accepted, text revised.	Henrik Carlsen	Stockholm Environment Institute	Sweden
24095	33	24	33	24	The Symbol "CO2" is used in the document extensively. It must be uniform throughout the document if CO2 or the scientific or chemical symbol for Carbon dioxide is to be used.	Editorial – copyedit to be completed prior to publication	Alfred Oforu Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana
7023	33	25	33	26	You state that little research exists for Latin America. Please consider referring to Bataille et al 2020 (synthesis paper for a special issue with papers from each country) below which provides all GHG (energy + AFOLU) net-zero pathways for Mexico, Ecuador, Argentina, Colombia, and Costa Rica, and AFOLU pathways for Peru. Demand adjustments, energy efficiency, electrification, bio and synfuels and AFOLU measures are considered across the countries. Source: Bataille, C., H. Waisman, A. Vogt Schillb, M. Jaramillo, Y. Briand, J. Svensson. R. Delgado, R. Arguello, L. Clarke, T. Wild, F. Lallana, G. Bravo, G. LeTreut, G. Nadal, G. Godinez, J. Quiros-Tortos, E. Pereira, M. Howells, D. Buira, J. Tovilla, J. Farbes, R. Jones, D. De La Torre Ugarte, M. Collado, F. Requejo, X. Gomez, R.Soria, D. Villamar, P. Rochedo, M. Imperio. 2020. Net-zero deep decarbonization pathways in Latin America: challenges and opportunities. Energy Strategy Reviews. Submitted and under review.	Noted. Will assess proposed reference.	CHRISTOPHER BATAILLE	IDDR1.ORG/SIMON FRASER UNVIERSITY	Canada

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30187	33	26	33	26	seriously doubt the value of comparing studies with very different goals. It boils down to comparing apples and oranges. Better to separate the studies in categories belonging to a 1.5C and WB2C compatible global goal (and dropping studies that are not compatible with the Paris goals)	Rejected. One cannot link individual national plans (in this case, aspirational) to agreed temperature limits, the respect of which depends on global emissions, over a longer period of time, without making additional assumptions about equity (what do other countries do) as well as about the future (how do emissions, of that particular country and of others, evolve beyond 2050).	Bert Metz	European Climate Foundation	Netherlands
24467	33	40	33	42	The renewable targets relate to resource endowments as well of fossil and renewable sources.	Rejected, unclear what text this comment is about	Subash Dhar	UNEP DTU Partnership, DTU	Denmark
10961	33		33		Solar energy does not lead to energy savings but it helps cover the energy demand of buildings. Its embodied GHG emissions should be accounted for in assessing the carbon footprint of buildings.	Taken into account.	Rolf Frischknecht	treeze Ltd.	Switzerland
10975	33		33		Please make clear whether it is about solar thermal or solar electricity. The life cycle based GHG emissions of solar electricity are higher than those of hydroelectric power and in most case also than those of wind power. Hence the statement ("lower environmental impacts than other renewables") is not correct.	Taken into account. Assume that 'solar electricity' refers to PV	Rolf Frischknecht	treeze Ltd.	Switzerland
46401	33	18	42	12	I find this section problematic. There are lots of statements without any deeper analysis, and many statements are supported by one study; e.g.: "For Canada to achieve the 2°C goal, space and water heating, road transport, and industrial and agricultural processes must be electrified" Is this the only way? Why? What about other drivers of GHG? For Africa "...CCS is not considered feasible". Why? Under all circumstances? " Etc.	Accepted, text revised	Henrik Carlsen	Stockholm Environment Institute	Sweden
37231	33	18			Many parts of this section come across a bit too prescriptive. Authors could improve by noting that the options for each country are only those suggested by existing analyses, and are influenced by assumptions made.	Accepted, text revised	Michiel Schaeffer	Climate Analytics	Netherlands
28701	34	1	36	1	On Table 4.5: 1. It is not immediately clear what this table aims to communicate with the readers. The table caption should be clear about it focusing on mid-century strategies investigated in the literature. 2. It would also need to be clarified, if the current set-up is to remain, that official long-term strategy documents are not covered. At the same time, Table 4.2 aims to cover official governmental projections as well, so it might be worth considering the inclusion of official LTS documents as well. 3. I also wonder why some countries like China has very concrete and specific numbers (i.e. 42% reduction) while Japan, for example, don't have any when it is probably possible to extract values from the studies if needed. 4. It is also not clear how these countries are selected. For the EU, for example, it would be most straightforward that Germany and France are included instead of Ireland. This needs to be clarified.	All comments accepted. Table 4.5 to be revised	Takeshi Kuramochi	NewClimate Institute	Germany
10243	34	1	37	1	Tabl 4.5 How was this information pulled together? I see the source Vaillancourt 2017, but perhaps it is worth looking at other sources (mid century strategy, DDPP for Canada)? Not all areas have been identified for Canada. For example, Canada has a Strategy on SLCPs :https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/short-lived-climate-pollutants.html There are multiple CCS projects in the Canadian industry (oil Sands upgrading - Shell Project Quest, petroleum refining/upgrading - Sturgeon Refinery, fertilizer - Agrium facility) , some of them are already operating, some of them will be in the near future.	Accepted, Table 4.5 to be revised. Will conduct more literature review on Canada. Will assess proposed reference	Aglaia Obrekh	Environment and Climate Change Canada	Canada
46399	34	1	37	1	Messy table, hard to follow.	Accepted, Figure 4.5. to be revised.	Henrik Carlsen	Stockholm Environment Institute	Sweden
8815	34		37		It would be interesting to check for industry sector whether the option of material efficiency/circular economy have been addressed for any of these regions by the literature at hand and if this could be added along with its contribution	Rejected. Out of scope of Ch4. Detailed description of mitigation pathways in the industry sector is in Ch11 (Industry)	Saygin Değer	SHURA Energy Transition Center	Turkey
19873	34		37		This table is confusing. As long-term target is presented for EU and China, "80% reduction" reduction" should also be presented for Japan as well.	Accepted, Table 4.5 to be revised.	Takahiko Tagami	Institute of Energy Economics, Japan	Japan
19875	34		37		Japan's long term strategy itself covers demand reduction, RE in industry, electrification and land use.	Noted. Will update Table 4.5. based on available literature	Takahiko Tagami	Institute of Energy Economics, Japan	Japan
20869	34		37		The 42%, 80%, 95% etc. seem to be a sort of reduction targets, not "mitigation measures". If that's the case, then change the title of the table or at least, add footnote to indicate what those numbers mean.	Accepted, footnote added to clarify this point.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
30895	34		37		Quite surprising that the table does not list CCS as a mitigation strategy for the USA and Canada, as both countries do extensive RD&D in this area. It could also help to lay out in the text section ahead of the table what the criteria were for getting a checkmark against a certain mitigation strategy.	Noted. Will update Table 4.5. based on available literature	Jasmin Kemper	IEA Greenhouse Gas R&D Programme (IEAGHG)	United Kingdom (of Great Britain and Northern Ireland)
10965	36	9	37	29	Please provide evidence that smart homes substantially help to reduce life cycle based (manufacture, construction, use and end of life) GHG emissions of buildings. Studies in Switzerland showed that even the energy saving effect is minimal!	Rejected, outside of scope of Ch4. Buildings are dealt with in details in Ch9. Also not clear what text comment is about.	Rolf Frischknecht	treeze Ltd.	Switzerland
20871	38	1	38	9	Relevant references should be provided here.	Accepted, text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
13479	38	2	38	5	Add reference for that. Fighting air pollution does not necessary means climate change mitigation and the "cleaner air for China" strategy mainly focusses on particulate matter and their precursors reductions (partly using end-of-pipe technologies). It leads to a strong reduction of PM precursors but CO2 and CH4 has continued to grow in the meantime (https://doi.org/10.1038/s41467-018-07891-7 ; https://doi.org/10.5194/acp-18-14095-2018)	Noted. Will assess proposed reference.	Sophie Szopa	Commissariat à l'Energie Atomique et aux Energies Alternatives	France
32433	38	2	38	5	Because SLCFs are co-emitted with CO2 in energy production, transportation, and industry, CO2 mitigation measures will also reduce some co-emitted non-CO2 climate forcers. CO2-targeted policies may be able to mitigate up to 70% of methane emissions and 30% of black carbon emissions. SLCP-targeted measures—like reducing methane from the agricultural sector and HFCs from cooling needs—are necessary for maximum benefit. Allen M., et al. (2018) TECHNICAL SUMMARY, in IPCC (2018) GLOBAL WARMING OF 1.5 °C, 33–34; Shoemaker J. K., et al. (2013) What Role for Short-Lived Climate Pollutants in Mitigation Policy?, SCIENCE 342:1323–1324; and Rogelj J., et al. (2018) CHAPTER 2: MITIGATION PATHWAYS COMPATIBLE WITH 1.5 °C IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT, in IPCC (2018) GLOBAL WARMING OF 1.5 °C, 96; Xu Y. & Ramanathan V. (2017) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, PROC. NAT'L. ACAD. SCI. 114(39):10315–10323 ("A fraction of CH4 (about 70%) and BC (about 30%) emissions can be mitigated through CO2-dedicated measures."). See also Climate & Clean Air Coalition (CCAC), Global Alliance to Significantly Reduce Methane Emissions in the Oil and Gas Sector by 2030 (last accessed 11 March 2020) ("Absolute reduction target of at least 45% reduction in methane emissions by 2025 and 60% to 75% by 2030. These are realistic and achievable targets, especially in a sector where technology and financing are largely available, and innovation supports even larger reductions. ... Reductions across the oil and gas industry in line with the Global Methane Alliance could reduce global emissions by 6 gigatons CO2e by 2030. According to the UNEP Emissions Gap Report 2019, this would achieve between 20%-50% of the emissions required to limit climate warming to 2-degrees. Reducing a short-lived climate pollutant like methane can buy us time to act more decisively in reducing CO2 emissions."); and Nisbet E. G., et al. (2020) Methane mitigation: methods to reduce emissions, on the path to the Paris Agreement, REVIEWS GEOPHYSICS 58(e2019RG000675):1–51, 1 ("Many methane mitigation options offer cost-effective approaches to cut global warming and bring the amount of methane in the air back to a pathway that is consistent with the aims of the Paris Agreement.").	Noted. Will try and refer to SLCFs a bit more.	Durwood Zaelke	Institute for Governance & Sustainable Development	United States of America
32435	38	2	38	5	Increased demand for air conditioning will increase energy demand that will thus require additional energy production. Energy efficiency, including in equipment efficiency like air conditioners, can reduce this demand and help limit additional emissions that would further exacerbate climate change. Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING; Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Rocky Mountain Institute; Shah, N., Wei, M., Letschert, V. and Phadke, A. (2019). Benefits of Energy Efficient and Low-Global Warming Potential Refrigerant Cooling Equipment. U.S.A: Lawrence Berkeley National Laboratory; Shah N., et al. (2015) Benefits Of Leapfrogging To Superefficiency And Low Global Warming Potential Refrigerants In Air Conditioning, Ernest Orlando Lawrence Berkeley National Laboratory; IEA (2018) Future of Cooling; Sustainable Energy for All (2018) Chilling Prospects: Providing Sustainable Cooling for All; and Birmingham Energy Institute, University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All; Biardeau, L.T., Davis, L.W., Gertler, P., Wolfram, C., 2020. Heat exposure and global air conditioning. Nature Sustainability 3, 25–28 ("Air conditioning adoption is increasing dramatically worldwide as incomes rise and average temperatures go up. Using daily temperature data from 14,500 weather stations, we rank 219 countries and 1,692 cities based on a widely used measure of cooling demand called total cooling degree day exposure. India, China, Indonesia, Nigeria, Pakistan, Brazil, Bangladesh and the Philippines all have more total cooling degree day exposure than the United States—a country that uses 400 terawatt-hours of electricity annually for air conditioning.").	Rejected. General point that increased demand for air conditioning will increase energy demand already made in text. Detailed description of the mechanism is out of scope of Ch4, and relevant to Ch9 (as well to as to WG2 chapter on buildings)	Durwood Zaelke	Institute for Governance & Sustainable Development	United States of America
32779	38	2	38	5	Because SLCFs are co-emitted with CO2 in energy production, transportation, and industry, CO2 mitigation measures will also reduce co-emitted non-CO2 climate forcers. CO2-targeted policies can mitigate 70% of methane emissions and 30% of black carbon emissions. SLCP-targeted measures—like reducing methane from the agricultural sector and HFCs from cooling needs—are necessary for maximum benefit. Allen M., et al. (2018) TECHNICAL SUMMARY, in IPCC (2018) GLOBAL WARMING OF 1.5 °C, 33–34; Shoemaker J. K., et al. (2013) What Role for Short-Lived Climate Pollutants in Mitigation Policy?, SCIENCE 342:1323–1324; and Rogelj J., et al. (2018) CHAPTER 2: MITIGATION PATHWAYS COMPATIBLE WITH 1.5 °C IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT, in IPCC (2018) GLOBAL WARMING OF 1.5 °C, 96; Xu Y. & Ramanathan V. (2017) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, PROC. NAT'L. ACAD. SCI. 114(39):10315–10323.	Noted. Will try and refer to SLCFs a bit more.	Kristin Campbell	Institute for Governance & Sustainable Development	United States of America

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32781	38	2	38	5	Increased demand for air conditioning can increase energy demand that will thus require additional energy production. Energy efficiency, including in equipment efficiency like air conditioners, can reduce this demand and help limit additional emissions that would further exacerbate climate change. Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Rocky Mountain Institute; Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING; Shah, N., Wei, M., Letschert, V. and Phadke, A. (2019). Benefits of Energy Efficient and Low-Global Warming Potential Refrigerant Cooling Equipment. U.S.A: Lawrence Berkeley National Laboratory; Shah N., et al. (2015) Benefits Of Leapfrogging To Superefficiency And Low Global Warming Potential Refrigerants In Air Conditioning, Ernest Orlando Lawrence Berkeley National Laboratory; IEA (2018) Future of Cooling; Sustainable Energy for All (2018) Chilling Prospects: Providing Sustainable Cooling for All; and Birmingham Energy Institute, University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All.	Rejected. General point that increased demand for air conditioning will increase energy demand already made in text. Detailed description of the mechanism is out of scope of Ch4, and relevant to Ch9 (as well to as to WG2 chapter on buildings)	Kristin Campbell	Institute for Governance & Sustainable Development	United States of America
7025	38	3	38	5	Why the focus only on energy efficiency for demand sectors for Asia? Demand sectors can also implement fuel switching to lower or zero carbon fuels (e.g. to clean electricity or biofuels), just like supply sectors.	Taken into account. Will make sure that demand-side decisions on choice of fuel are included in 4.2.5	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNVIERSITY	Canada
32437	38	6	38	9	Increased demand for air conditioning will increase energy demand that will thus require additional energy production. Energy efficiency, including in equipment efficiency like air conditioners, can reduce this demand and help limit additional emissions that would further exacerbate climate change. Dreyfus G., et al. (2020) ASSESSMENT OF CLIMATE AND DEVELOPMENT BENEFITS OF EFFICIENT AND CLIMATE-FRIENDLY COOLING; Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Rocky Mountain Institute; Shah, N., Wei, M., Letschert, V. and Phadke, A. (2019). Benefits of Energy Efficient and Low-Global Warming Potential Refrigerant Cooling Equipment. U.S.A: Lawrence Berkeley National Laboratory; Shah N., et al. (2015) Benefits Of Leapfrogging To Superefficiency And Low Global Warming Potential Refrigerants In Air Conditioning, Ernest Orlando Lawrence Berkeley National Laboratory; IEA (2018) Future of Cooling; Sustainable Energy for All (2018) Chilling Prospects: Providing Sustainable Cooling for All; and Birmingham Energy Institute, University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All; Biardeau, L.T., Davis, L.W., Gertler, P., Wolfram, C., 2020. Heat exposure and global air conditioning. Nature Sustainability 3, 25–28 (“Air conditioning adoption is increasing dramatically worldwide as incomes rise and average temperatures go up. Using daily temperature data from 14,500 weather stations, we rank 219 countries and 1,692 cities based on a widely used measure of cooling demand called total cooling degree day exposure. India, China, Indonesia, Nigeria, Pakistan, Brazil, Bangladesh and the Philippines all have more total cooling degree day exposure than the United States—a country that uses 400 terawatt-hours of electricity annually for air conditioning.”).	Rejected. General point that increased demand for air conditioning will increase energy demand already made in text. Detailed description of the mechanism is out of scope of Ch4, and relevant to Ch9 (as well to as to WG2 chapter on buildings)	Durwood Zaelke	Institute for Governance & Sustainable Development	United States of America
32783	38	6	38	9	Increased demand for air conditioning can increase energy demand that will thus require additional energy production. Energy efficiency, including in equipment efficiency like air conditioners, can reduce this demand and help limit additional emissions that would further exacerbate climate change. Sachar et al. (2018) Solving the Global Cooling Challenge: How to Counter the Climate Threat from Room Air Conditioners. Rocky Mountain Institute; International Energy Agency (2019) Perspectives for the Clean Energy Transition: The Critical Role of Buildings; Shah, N., Wei, M., Letschert, V. and Phadke, A. (2019). Benefits of Energy Efficient and Low-Global Warming Potential Refrigerant Cooling Equipment. U.S.A: Lawrence Berkeley National Laboratory; Shah N., et al. (2015) Benefits Of Leapfrogging To Superefficiency And Low Global Warming Potential Refrigerants In Air Conditioning, Ernest Orlando Lawrence Berkeley National Laboratory; IEA (2018) Future of Cooling; Sustainable Energy for All (2018) Chilling Prospects: Providing Sustainable Cooling for All; and Birmingham Energy Institute, University of Birmingham (2018) A Cool World: Defining the Energy Conundrum of Cooling for All.	Rejected. General point that increased demand for air conditioning will increase energy demand already made in text. Detailed description of the mechanism is out of scope of Ch4, and relevant to Ch9 (as well to as to WG2 chapter on buildings)	Kristin Campbell	Institute for Governance & Sustainable Development	United States of America
10957	38	8	38	26	The description of life cycle assessment based GHG emission data of construction materials is too short and furthermore highlights variability without giving the reasons for differences in carbon footprint figures. This section should be expanded substantially and highlight the positive and successful examples of combinations of LCA methodology, databases, design tools and building related benchmarks such as the one in Switzerland (SIA 2040 "energy efficiency path"; KBOB recommendation 2009/1:2016 Life Cycle Assessment Data in Construction", https://www.kbob.admin.ch/dam/kbob/it/dokumente/Publikationen/Nachhaltiges%20Bauen/Archiv_2015-2019/2009_1-2016%20Oekobilanzdaten%20im%20Baubereich.pdf.download.pdf/2009_1-2016%20Oekobilanzdaten%20im%20Baubereich.pdf)	Rejected. Out of scope of Ch4. Might be relevant for Ch9 (buildings)	Rolf Frischknecht	treeze Ltd.	Switzerland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30191	38	10	38	10	80% reduction by 2050 for Japan is totally inconsistent with 1.5C	Rejected. One cannot link individual national plans (in this case, aspirational) to agreed temperature limits, the respect of which depends on global emissions, over a longer period of time, without making additional assumptions about equity (what do other countries do) as well as about the future (how do emissions, of that particular country and of others, evolve beyond 2050).	Bert Metz	European Climate Foundation	Netherlands
28703	38	10	38	11	For example, in Japan, 1.5°C or 80% emissions reduction by 2050 requires the newest technologies and transformative strategies.' >> This statement is valid not just for Japan but for the entire world, so I feel it's a bit strange to specifically mention it for Japan.	Accepted. Text revised	Takeshi Kuramochi	NewClimate Institute	Germany
19877	38	10	38	14	Japan's 80% target is not specifically linked with 1.5 degree target. It is aiming at decarbonization as early as possible in the latter half of this century for achieving the objective of the Paris Agreement.	Accepted, text revised (this was based on how the referenced paper defined the scenario)	Takahiko Tagami	Institute of Energy Economics, Japan	Japan
19879	38	10	38	14	Japan's long term strategy refers not only to CCS. Hydrogen but also advanced nuclear and storage technologies.	Accepted, text revised.	Takahiko Tagami	Institute of Energy Economics, Japan	Japan
28705	38	10	38	14	Upon formulation of post-Fukushima accident energy and climate policy and NDCs, the Japanese government has published large amount of analysis documents (work done by NIES, IEEJ and other think tanks and consultancies - Dr. Masui knows all too well!). While they are not peer-reviewed, English-written journal articles, it might be worth mentioning them if IPCC rules allow for it.	Noted. To the extent possible, we will stick to peer-reviewed literature.	Takeshi Kuramochi	NewClimate Institute	Germany
39221	38	10	38	14	For Japan (and likely for several other countries too), lowering final energy consumption is also a main feature of mid-century mitigation pathways indicated by macroeconomic modeling approaches (e.g. Silva Herrant et al., Climate Policy 2019).	Noted. Will assess proposed reference.	Diego Silva Herran	National Institute for Environmental Studies	Japan
873	38	15	38	18	However, China has been rapidly moving to embrace more coal-fired energy production. This should be included in the discussion because it will act counter to global mitigation pathways.	Accepted, text revised.	Michael Kennish	Rutgers University	United States of America
28707	38	16	38	16	CCS>> CCS?	Editorial – copyedit to be completed prior to publication	Takeshi Kuramochi	NewClimate Institute	Germany
34069	38	17	38	17	It could be relevant to distinguish the respective share of nuclear and renewable	Noted. Will distinguish if data available.	Antoine BONDUELLE	Climate Action Network France	France
35367	38	17	38	17	It could be relevant to distinguish the respective share of nuclear and renewable	Noted. Will distinguish if data available.	Charlotte MIJEON	Réseau "Sortir du nucléaire" - member of the French Réseau Action Climat	France
16085	38	22	38	27	A review paper on India in Annual Reviews of Env and Resources may be a useful source. https://www.annualreviews.org/doi/abs/10.1146/annurev-environ-102017-025809	Noted. Will assess proposed reference.	Navroz Dubash	Centre for Policy Research	India
12729	38	23	38	41	India is major developer of nuclear power as well. Please make a mention to nuclear power.	Accepted. Text revised.	Bertrand Magne	International Atomic Energy Agency	Austria
10245	38	32	38	39	According to Table 4.5, Mitigation through Land Use is also considered for Brazil, and given the recent events (wildfires, changes to the deforestation governance) and the heavy reliance of the use of biomass in power sector - the land use should be one of the sectors looked closely at, to make sure that negative emissions due to BECCS do not lead to an increase in emissions in the land sector.	Accepted. Text revised.	Aglaia Obrekht	Environment and Climate Change Canada	Canada
34071	38	40	38	40	This sentence is not precise enough	Accepted. Text revised.	Antoine BONDUELLE	Climate Action Network France	France
35369	38	40	38	40	This sentence is not precise enough	Accepted. Text revised.	Charlotte MIJEON	Réseau "Sortir du nucléaire" - member of the French Réseau Action Climat	France
7027	38	40	38	41	Suggest adding "currently" to first clause "Although not (currently) having a significant role, nuclear energy is part of the solution 41 (Lucena et al. 2016)."	Accepted. Text revised.	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNVIERSITY	Canada
39219	38	31	39	9	The role of mitigating LUC and agriculture emissions in Latin America is missing. Given that these sectors are a major source of GHG emissions in the region (in contrast to other regions) a brief statement on the understanding of the mitigation potential in these sectors is expected.	Accepted. Text revised.	Diego Silva Herran	National Institute for Environmental Studies	Japan
10967	38	43	39	6	This section needs careful review and substantially extended. What definitions were applied to call the buildings "passive house" or "NZE buildings"? Those using emission credits due to exported electricity/energy should be excluded from the figure or at least be flagged (shown in a separate category), see general comment above.	Accepted. Section substantially revised.	Rolf Frischknecht	treeze Ltd.	Switzerland
30189	38	1	40	8	Also for these sections only studies that aim for a WB2c/1.5C compatible reduction by 2050 should be selected. Covering Other studies that are incompatible with the Paris goals only confuses the discussion. When you apply this selection, then it would be interesting to show the different approaches in the various Asian countries. But without the selection it just is a list of different priorities/goals without much meaning	Taken into account. Scope of mitigation studies covered in section 4.2.5 to be clarified.	Bert Metz	European Climate Foundation	Netherlands
16225	38	1			In Section 4.2.5.2.1 Asia, consider adding a description of China's military emissions, for clarity and accuracy. The increasing number of Chinese military bases and activities puts their military emissions on a similar scale to US military emissions, which are significant.	Rejected. Emissions from military are included into inventories, but data typically does not allow to separate them out.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
20873	38	22			A parenthesis before Dhar et al. is missing.	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
24097	39	1	39	1	Increased electrification perse does not lead to increased GHG emissions. It leads to an increase in electricity demand but the source of electricity will be the determinoining factor as to whether it will lead to an increase in GHG emissions. There is the need to analyse the alternative power sources available to Africa before conclusions are drawn. The Grand Inga power project in DRC has a capacity of 40,000 MW and is capable of supplying electricity without burning a kilogram of fossil fuel.	Accepted. Text revised.	Alfred Ofosu Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana

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7029	39	1	39	3	find it questionable that a \$20/t USD carbon tax could add \$0.083-0.096/kwh to Chilean electricity prices.Perhaps they increase to this level, but this absolute increase doesn't make physical/economic sense. The mix is ~58% fossil thermal, and even if it was all 33% efficient coal \$20/t would increase costs only \$0.011/kwh	Accepted. Text revised.	CHRISTOPHER BATAILLE	IDDR1.ORG/SIMON FRASER UNNIVERSITY	Canada
37261	39	10	39	10	to enhance the context, consider adding another example of another African country. South Africa does not fully represent the "African picture"	Noted. Will include other country examples, literature permitting.	Michiel Schaeffer	Climate Analytics	Netherlands
9975	39	11	39	18	For Sub-Saharan Africa, the key development goals and drivers of climate action include not only expanding energy access but also mitigating air pollution and death rates due to heavy reliance on traditional biomass use in households:- 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.	Noted. Will assess proposed reference.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
37263	39	15	39	17	Not as simple as add PV & wind. May want to study Bischof-Nlrmz & Creamer, 2019	Noted. Will assess proposed reference.	Michiel Schaeffer	Climate Analytics	Netherlands
24099	39	15	39	18	Why is nuclear energy not being considered for South Africa or other African countries. Renewable energy, Solar, wind etc are intermittent and unreliable sources of electricity for any meaningful development. If coal is bad, it must be bad for all countries. If nuclear is good for Climate change mitigation, it must be applicable to all countries irrespective of geographical location.	Noted. Will conduct additional literature review on this topic.	Alfred Ofoosu Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana
18011	39	18	39	18	This statement should not stand alone as it is contradicted by actual policy and activity in South Africa, see Beck et al (2013) Energy Procedia Vol37 p6502, and Beck et al (2017) Energy Procedia Vol114 p5636.	Noted. Will assess proposed reference.	Tim Dixon	IEAGHG	United Kingdom (of Great Britain and Northern Ireland)
20877	39	19	39	24	In terms of the balance of spaces allotted to each region, more should be added to 4.2.5.2.4 North America. Especially for the USA, implications of USA's withdrawal from PA for accelerating mitigation could be also addressed here.	Accepted. Will conduct additional literature review on North America region.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
30897	39	19	39	24	See previous comment.	Noted.	Jasmin Kemper	IEA Greenhouse Gas R&D Programme (IEAGHG)	United Kingdom (of Great Britain and Northern Ireland)
10247	39	20	39	21	This is very minimal, suggest including information from Canada's mid-century strategy, DDPF for Canada.	Rejected. Mid-century strategies are described in section 4.2.4.	Aglaia Obrekht	Environment and Climate Change Canada	Canada
45409	39	22	39	24	What about nuclear as a source of industrial process heat? High-temperature gas-cooled reactors specifically, are good sources of industrial heat. China has a pair of demonstration modular HTGRs coming online soon.	Rejected. Detailed technological assessment is included in Ch6 (energy systems) or 11 (industry)	Jessica Lovering	Carnegie Mellon University	United States of America
34073	39	23	39	23	It would be useful here to distinguish the respective share of nuclear and renewable	Noted. Will distinguish if data available.	Antoine BONDUELLE	Climate Action Network France	France
35371	39	23	39	23	It would be useful here to distinguish the respective share of nuclear and renewable	Noted. Will distinguish if data available.	Charlotte MIJEON	Réseau "Sortir du nucléaire" - member of the French Réseau Action Climat	France
9977	39	25	39	44	The list is not exhaustive but includes indicative examples. It would be more representative if technologically locked-in countries (like Greece or Poland) were included. For example, in Poland, mitigation strategies and climate debates differ significantly from other EU member states, with resulting technological pathways depending significantly on uncertainties regarding technological failures, innovation rates, costs and international stringency:- Kiuila, O. (2018). Decarbonisation perspectives for the Polish economy. Energy Policy, 118, 69-76.- Antosiewicz, M., Nikas, A., Szpor, A., Witajewski-Baltvilks, J., & Doukas, H. (2019). Pathways for the transition of the Polish power sector and associated risks. Environmental Innovation and Societal Transitions.	Noted. Will assess proposed reference.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
12731	39	26	39	26	France's mitigation strategy is articulated around nuclear power, renewable deployment, energy storage and energy efficiency measures. Biofuels are less than secondary. Please replace reference.	Accepted. Will expand literature review.	Bertrand Magne	International Atomic Energy Agency	Austria
28709	39	26	39	27	Does this refer to current policies or long-term policy vision toward 2050? Not clear what the main message is.	Accepted. Text revised.	Takeshi Kuramochi	NewClimate Institute	Germany
12733	39	39	39	40	Italy has no plan to develop nuclear energy. Please reconsider the phrasing. In addition, this Massetti (2012) reference may be outdated.	Accepted. Text revised.	Bertrand Magne	International Atomic Energy Agency	Austria
34075	39	39	39	40	Italy is a bad example because nuclear power has been twice refuse though a referendum and existing plants have been dismantled.	Accepted. Text revised.	Antoine BONDUELLE	Climate Action Network France	France
35373	39	39	39	40	For this country (Italy), it is controversial to mention a path that does not take into account a clear social preference and democratic decision against nuclear power, expressed twice by referendum in 1987 and 2011.	Accepted. Text revised.	Charlotte MIJEON	Réseau "Sortir du nucléaire" - member of the French Réseau Action Climat	France
6153	39	25	40	8	miss a discussion of the EU strategy for net neutrality in 2050, including the instruments proposed.	Taken into account. Will look for literature on EU strategy.	Linares Pedro	Universidad Pontificia Comillas	Spain
44587	39	25	40	8	The Europe section is quite patchy and the literature is focused on the old target range (80-95%), which could be kept if one considers this a 2C compatible target range. More interesting are probably the now emerging studies on "net zero GHG by 2050" pathways, which already have a net negative power sector by 2050 and high levels of CDR, incl. technologies like BECCS/DACCS and a full accounting of LULUCF sinks. Unfortunately, by now there are mainly quasi-official studies (like the "Net Zero" study by the UK Climate Change Committee or the In-Depth Analysis accompanying the EU Commission's draft Long-Term Strategy). We will see more net zero studies commissioned by national governments in the coming two years, and also more peer-reviewed studies like this one on the EU https://www.sciencedirect.com/science/article/abs/pii/S0301421519305476	Noted. Will assess proposed reference.	Oliver Geden	German Institute for International and Security Affairs	Germany

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
16227	39	10			For Section 4.2.5.2.3 Africa, consider adding a treatment of planned nuclear power generation in the region, including offshore plants based on the Russian Akademik Lomonosov, for a clearer picture of energy development there. Also related is the risk of nuclear arms proliferation in the region as a result of increased availability of materials, knowledge and technology for arms that will come with increased nuclear power usage to new countries.	Accepted. Will expand literature review.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
20875	39	14			incorrect phrase -> more use "of" renewables	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
12735	40	1	40	1	A quarter of electricity generated in the EU is nuclear-based. More than half a dozen European countries are developing nuclear capacity to reduce emissions. Could this be mentioned?	Accepted. Text revised.	Bertrand Magne	International Atomic Energy Agency	Austria
9979	40	1	40	8	<p>Cutting emissions in the EU will require "EU-wide, rather than individual-country, solutions", but it also includes challenges of monitoring nature: the submission of a collective NDC from the European Union requires that Member States deliver on their national commitments and the Community successfully monitor progress made at both scales:</p> <p>- 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.</p> <p>It also entails challenges of inter-Member State flexibility mechanisms and burden sharing:</p> <p>- Vielle, M. (2019). Navigating various flexibility mechanisms under European burden-sharing. Environmental Economics and Policy Studies, 1-47.</p> <p>There could be mentioned other requirements for the electricity system, e.g.:</p> <p>- Capros, P., De Vita, A., Tasios, N., Siskos, P., Kannavou, M., Petropoulos, A., ... & Paroussos, L. (2016). EU Reference Scenario 2016-Energy, transport and GHG emissions Trends to 2050.</p> <p>Fürsch, M., Hagspiel, S., Jägemann, C., Nagl, S., Lindenberger, D., & Tröster, E. (2013). The role of grid extensions in a cost-efficient transformation of the European electricity system until 2050. Applied Energy, 104, 642-652.</p> <p>- Plessmann, G., & Blechinger, P. (2017). How to meet EU GHG emission reduction targets? A model based decarbonization pathway for Europe's electricity supply system until 2050. Energy Strategy Reviews, 15, 19-32.</p> <p>- Forouli, A., Doukas, H., Nikas, A., Sampetro, J., & Van de Ven, D. J. (2019). Identifying optimal technological portfolios for European power generation towards climate change mitigation: A robust portfolio analysis approach. Utilities Policy, 57, 33-42.</p>	Noted. Will assess proposed reference.	Haris Doukas	School of Electrical and Computer Engineering, National Technical University of Athens	Greece
30193	40	9	40	15	lifestyle impacts and lifestyle changes should also be discussed here	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
46403	40	16	40	16	I don't see any discussion related to the broader term circular economy. Key to related to this discourse.	Taken into account. Circular economy is discussed in details in Ch5. It will be mentioned in Ch4, section 4.3.1.	Henrik Carlsen	Stockholm Environment Institute	Sweden
44589	40	18	40	18	CCS as such is not a carbon removal technology but only conventional mitigation	Noted.	Oliver Geden	German Institute for International and Security Affairs	Germany
46405	40	23	40	24	Is quality of life a driver?	Accepted, text revised.	Henrik Carlsen	Stockholm Environment Institute	Sweden
875	40	23	40	25	What is the status of the five main drivers of long-term energy demand reduction? Are they implemented? If so, how effective are they in mitigating emissions? Chapter 4 discusses drivers of GHG emissions, mitigation and development pathways and plans, mitigation actions needed to reduce emissions, and transformational changes necessary to achieve net zero emissions. However, the chapter does not objectively analyze the effectiveness of the drivers and, as a result, does not determine the probability of successfully achieving mitigation goals in the near- and mid-term.	Taken into account. Will make difference between drivers and implementation clearer.	Michael Kennish	Rutgers University	United States of America
30195	40	23	40	31	Would be important to provide examples, experiences, etc to provide evidence to policy makers that this might be a viable approach. With the current rather academic description it will not be taken seriously by policy	Taken into account. Examples to be developed here and in section on enabling conditions (currently 4.4.2).	Bert Metz	European Climate Foundation	Netherlands
27763	40	32	41	37	See my substantive comments ch 17 p 17 45 ff	Rejected. Not clear what comment on Ch17 the present comment relates to.	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
15519	40	38	41	15	It isn't immediately clear here what should qualify as a "systems approach", but it would seem that, in addition to technology innovation, this section should also discuss how to move rapidly away from fossil fuels through "exnovation" or other means of weakening the investment climate for high-carbon industries, namely fossil fuels, and otherwise delimiting fossil fuel interests. See e.g. Davidson, D. J. Exnovating for a renewable energy transition. Nature Energy 1 (2019) doi:10.1038/s41560-019-0369-3. See also Geels, F. W., Tyfield, D. & Urry, J. Regime Resistance against Low-Carbon Transitions: Introducing Politics and Power into the Multi-Level Perspective. Theory, Culture & Society 31, 21–40 (2014). & Erickson, P. et al. Why fossil fuel producer subsidies matter. Nature 578, E1–E4 (2020).	Noted. Will assess proposed reference.	Peter Erickson	Stockholm Environment Institute	United States of America
44925	40	39	41	15	4.2.5.3.2 Systems Analysis. The functional role of biodiversity and ecosystem integrity need to be incorporated into systems thinking, particularly when considering product substitution and expansion of bionergy	Accepted. Text revised.	Virginia Young	Australian Rainforest Conservation Society, Griffith University, CAN Ecosystems	Australia
30197	40	44	41	2	The materials approach deserves much more attention. Show the potential, provide examples and experiences and indicate policy options. Without such detail policy makers will not take this seriously.	Taken into account. Will consider expanding here and in section on enabling conditions (4.4.2)	Bert Metz	European Climate Foundation	Netherlands

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29037	40	1		3	The EU now has the target to become carbon neutral and scenarios for almost 100% GHG reduction exist. However this is not cited here, but Hübler and Löschel 2013, which is somewhat old in this discussion.	Accepted. Text revised.	Arnulf JÄGER-WALDAU	European Commission, JRC	Italy
29039	40	7		8	It is questionable whether the economic assumptions of (Schiffer 2015) for CCS are reasonable given the rapid cost reduction in the field of renewable energies and storage technologies compared to the slow development in CCS technologies for power plants	Noted. Will check statement with additional literature.	Arnulf JÄGER-WALDAU	European Commission, JRC	Italy
20879	40	12			cost assessment (4.2.5.3) -> (4.2.5.3.5)	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20881	40	13			(see 4.3.3.4) -> (see 4.3.3.5)	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
36233	41	16	36		How can you address SLCP without mentioning fuelwood, charcoal, kerosene for lighting and cooking? This is a serious mitigation issue for poor countries with large co-benefits beyond agriculture and health. Charcoal and firewood are sources of GHG emissions in those countries	Taken into account. Fuel use and end-use level to be mentioned alongside indoor air pollution issues.	Youba Sokona	South Centre	Switzerland
2175	41	2	41	2	Please, add after line 2: "Low carbon cements may be selected to produce low carbon concretes. Even more, concretes could be designed to absorb a relative amount of carbon dioxide from the atmosphere (Sanjuán et al. 2019)": Sanjuán, M.Á.; Estévez, E.; Argiz, C. Carbon Dioxide Absorption by Blast-Furnace Slag Mortars in Function of the Curing Intensity. <i>Energies</i> 2019, 12(12), 2346; https://doi.org/10.3390/en12122346	Rejected. Detailed mitigation option in building sector are dealt with in Ch9 (buildings)	Miguel Angel Sanjuán	Technical University of Madrid	Spain
12493	41	2	41	2	Please, add : "Low carbon cements may be used to produce low carbon concretes. In addition, concretes may be designed to absorb carbon dioxide from the atmosphere (Sanjuán et al 2019; Sanjuán et al 2020; Xi et al 2016)." Sanjuán, M.Á.; Estévez, E.; Argiz, C. Carbon Dioxide Absorption by Blast-Furnace Slag Mortars in Function of the Curing Intensity. <i>Energies</i> 2019, 12(12), 2346; https://doi.org/10.3390/en12122346 Xi, F.; Davis, S.J.; Ciais, P.; Crawford-Brown, D.; Guan, D.; Pade, C.; Shi, T.; Syddall, M.; Lv, J.; Ji, L.; et al. Substantial global carbon uptake by cement carbonation. <i>Nat. Geosci.</i> 2016, 9, 880–883. https://doi.org/10.1038/NGEO2840 Sanjuán, M.Á.; Andrade, C.; Mora, P.; Zaragoza, A. Carbon Dioxide Uptake by Cement-Based Materials: A Spanish Case Study. <i>Appl. Sci.</i> 2020, 10, 339. https://doi.org/10.3390/app10010339	Rejected. Detailed mitigation option in building sector are dealt with in Ch9 (buildings)	MORA PERIS PEDRO	Profesor Titular de Universidad de la ETSI Minas y Energía de la Universidad Politécnica de Madrid	Spain
39701	41	3	41	5	There is already a broad range of studies considering the full biomass interlinkages, and at least some of respective references should be referred to, e.g. Callo-Concha, Daniel et al. (2020) Food and Non-Food Biomass Production, Processing and Use in sub-Saharan Africa: Towards a Regional Bioeconomy. <i>Sustainability</i> 12: 2013; Fritsche, Uwe & Rösch, Christine (2020) The conditions for a sustainable bioeconomy. In: Pietzsch, Joachim (ed.) <i>Bioeconomy for Beginners</i> . Berlin, Heidelberg: 177-202 https://doi.org/10.1007/978-3-662-60390-1_9 ; Berndes, Göran et al. (2019) Methods and tools to assess the sustainability of biomass and bioenergy supply chains. Summary of findings under Objective 1 of the IEA Bioenergy inter-Task project "Measuring, governing and gaining support for sustainable bioenergy supply chains. IEA Bioenergy: ExCo: 2019: 02 http://itp-sustainable.ieabioenergy.com/wp-content/uploads/2019/06/Intertask-Sustainability-O1-summary-26.3.2019.pdf ; Beuchelt, Tina & Nassl, Michael (2019) Applying a Sustainable Development Lens to Global Biomass Potentials. <i>Sustainability</i> 11 (18): 5078; Brinkman, Marnix et al. (2019) Projecting socio-economic impacts of bioenergy: Current status and limitations of ex-ante quantification methods. <i>Renewable and Sustainable Energy Reviews</i> 115: 109352; Correa, Diego et al. (2019) Towards the implementation of sustainable biofuel production systems. <i>Renewable and Sustainable Energy Reviews</i> 107: 250-263; Fedorova, Elena & Pongrácz, Eva (2019) Cumulative social effect assessment framework to evaluate the accumulation of social sustainability benefits of regional bioenergy value chains. <i>Renewable Energy</i> 131: 1073-1088; Fritsche, Uwe R. (2019) Sustainability of Bioenergy - State of the art. In: Lago, Carmen; Caldes, Natalia & Lechon, Yolanda (eds.) <i>The Role of Bioenergy in the Emerging Bioeconomy - Resources, Technologies, Sustainability and Policy</i> . Academic Press. London etc.: 225-241 https://doi.org/10.1016/B978-0-12-813056-8.00006-6 ; Junginger, Martin et al. (2019) Measuring, governing and gaining support for sustainable bioenergy supply chains - Main findings and recommendations. IEA Bioenergy: ExCo: 2019: 05 http://itp-sustainable.ieabioenergy.com/wp-content/uploads/2019/06/Intertask-Sustainability-Main-findings-and-recommendations-17.5.2019-1.pdf ; Junginger, Martin; Koppejan, Jaap & Goh, Chun (2019) Sustainable bioenergy deployment in East and South East Asia: notes on recent trends. <i>Sustainability Science</i> https://doi.org/10.1007/s11625-019-00712-w ; Mai-Moulin, Thuy et al. (2019) Toward a harmonization of national sustainability requirements and criteria for solid biomass. <i>Biofuels, Bioproducts and Biorefining</i> 13 (2): 405-421; Mai-Moulin, Thuy; Fritsche, Uwe & Junginger, Martin (2019) Charting	Noted. Will assess proposed reference.	Uwe Fritsche	IINAS	Germany
30199	41	3	41	7	Again, the bioenergy systems approach deserves a much deeper and broader discussion (in other chapters? then refer); in this way it will not have any impact	Accepted. Will provide link to relevant sections in Ch7	Bert Metz	European Climate Foundation	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
32439	41	3	41	7	Bioenergy is not carbon neutral nor carbon negative in the relevant time period of the next couple of decades for slowing feedbacks and tipping points; it leaves a carbon deficit for 44 to 104 years. Sterman J. D., et al. (2018) Does replacing coal with wood lower CO2 emissions? Dynamic lifecycle analysis of wood bioenergy, ENVTL. RESEARCH LETTERS 13(015007):1–10, 1 (“We simulate substitution of wood for coal in power generation, estimating the parameters governing NPP and other fluxes using data for forests in the eastern US and using published estimates for supply chain emissions. Because combustion and processing efficiencies for wood are less than coal, the immediate impact of substituting wood for coal is an increase in atmospheric CO2 relative to coal. The payback time for this carbon debt ranges from 44–104 years after clear-cut, depending on forest type—assuming the land remains forest. Surprisingly, replanting hardwood forests with fast-growing pine plantations raises the CO2 impact of wood because the equilibrium carbon density of plantations is lower than natural forests. Further, projected growth in wood harvest for bioenergy would increase atmospheric CO2 for at least a century because new carbon debt continuously exceeds NPP. Assuming biofuels are carbon neutral may worsen irreversible impacts of climate change before benefits accrue. Instead, explicit dynamic models should be used to assess the climate impacts of biofuels.”). In addition, competition for land from large deployment of BECCS is extremely likely. Using BECCS to draw down the between 2 and 10 Gt CO2 annually that is mentioned in IAM reports would require the dedication of land equivalent to the size of India, and possibly even double this amount, to support biomass production, introducing daunting logistical issues. See Anderson K. & Peters G. (2016) The trouble with negative emissions, Science 354:182–183, 183.	Accepted. Will provide more on this topic, either directly or via reference to relevant sections in other chapters.	Durwood Zaelke	Institute for Governance & Sustainable Development	United States of America
30201	41	8	41	11	Again, innovation deserves a much deeper and broader discussion. You cannot deal with that in 2 sentences. If in other chapter, then refer.	Accepted. Will provide more on this topic, either directly or via reference to relevant sections in other chapters, notably 16	Bert Metz	European Climate Foundation	Netherlands
877	41	12	41	15	If physical drivers of inertia needed to support accelerated mitigations are not considered, then what are the prospects that the 1.5°C or 2°C temperature scenarios will be realistically achieved?	Accepted. Will qualify statement.	Michael Kennish	Rutgers University	United States of America
30203	41	12	41	15	“Drivers of inertia” also deserve a much deeper treatment. If in other chapter, then refer	Accepted. Will refer to relevant sections in other chapters.	Bert Metz	European Climate Foundation	Netherlands
36689	41	16	41	16	“SLCP” is used here to assess the role of short-lived climate forcers while WGI defines SLCPs. It would be good to use consistent terminology as the difference between SLCPs and SLCFs can get confusing.	Accepted. Text revised	Vaishali Naik	NOAA GFDL	United States of America
13483	41	16	41	36	It has been decided in WG1 to talk about SLCP (including both warming and cooling shortlived) rather than SLCP (introduced by the CCAC for political purpose), it could avoid confusion if WG3 does the same.	Accepted. Text revised	Sophie Szopa	Commissariat à l’Energie Atomique et aux Energies Alternatives	France
13487	41	16	41	36	This paragraph does not reflect the lack of consensus about SLCP mitigation and the respective role of decarbonization vs air pollution control. We would expect in this chapter to have a clear “reading-grid” of the various scenarios and how do they compare in term of emissions and hypothesis to better understand how various authors come to different conclusions. It’s a bit discussed in WG1 chapter 6 (section 6.5 of the SOD) but we failed to discuss in depth the nuances between various scenario of the literature when they are not SSPs pathways.	Accepted. Text revised to include more on respective role of decarbonization vs. air pollution control.	Sophie Szopa	Commissariat à l’Energie Atomique et aux Energies Alternatives	France
27765	41	17	41	18	Please consider changing the order of the two first sentences	Accepted. Text revised	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
879	41	17	41	19	Short-lived pollutants (SLCPs) also affect climate-change mitigation pathways. If these pollutants are not reduced concomitantly with CO2 emissions, it is likely that temperature increases will exceed 1.5°C during the 2030s and 2°C by 2050 unless there are steep reductions in CO2 and SLCPs. However, there is no information from the literature cited in this chapter of the current reduction rates for SLCPs in many countries, nor the estimates for reduction rates of SLCPs projected over the next 30 years for most of them. Hence, there appears to be a lack of critical data necessary to accurately determine future temperature increase projections. There should be greater discussion and assessment of the accuracy of the databases as well as the data limitations related to future CO2 and SLCPs concentrations.	Taken into account. Will try and provide additional information on SLCPs separately from information on CO2, literature permitting	Michael Kennish	Rutgers University	United States of America
13481	41	17	41	19	In WG1 chapter 6, we find that in SSP1 2.6 and SSP 1 1.9, the total effect of SLCPs decrease is a (small) warming, so please be attentive, at the next stage, to homogenize such sentence with the CMIP6 findings detailed in WG1.	Accepted. Text revised.	Sophie Szopa	Commissariat à l’Energie Atomique et aux Energies Alternatives	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
32441	41	17	41	36	<p>Add that SLCP mitigation can provide avoided warming at 2050 of up to 0.6 °C, and CO2 can provide avoid warming of up to 0.1–0.3 °C, and that SLCPs can avoid 1.2 °C warming at 2100, and CO2 can avoid 1.6–1.9 °C at 2100. Critically, SLCP reductions can provide the most avoided warming to slow feedbacks and tipping points, including in the vulnerable Arctic. See Xu and Ramanathan (2017) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, Proc. Natl. Acad. Sci. 114(39):10315–10323; Ramanathan and Xu (2010) The Copenhagen Accord for limiting global warming: Criteria, constraints, and available avenues, Proc. Natl. Acad. Sci. 107(18):8055–8062; Ramanathan and Feng (2008) On avoiding dangerous anthropogenic interference with the climate system: Formidable challenges ahead, Proc. Natl. Acad. Sci. 105(38):14245–14250; Ramanathan, Molina, and Zaelke (2017) Well Under 2 Degrees Celsius: Fast Action Policies to Protect People and the Planet from Extreme Climate Change. Reducing black carbon is especially beneficial for the Arctic because black carbon not only warms the atmosphere but also facilitates additional warming. Once black carbon is deposited on the snow and ice, it reduces the reflectivity (albedo) and absorbs extra solar radiation, which leads to further melting than pristine snow and ice. Since 1890, black carbon has contributed about 0.5–1.4 °C of warming to the Arctic. Bond T. C., et al. (2013) Bounding the role of black carbon in the climate system: A scientific assessment, J. GEOPHYSICAL RESEARCH–ATMOSPHERES 118(11):5380–5552; Myhre G., et al. (2013) CHAPTER 8: ANTHROPOGENIC AND NATURAL RADIATIVE FORCING, in IPCC (2013) CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Table 8.A.6; Qian Y., et al. (2014) Light-absorbing Particles in Snow and Ice: Measurement and Modeling of Climatic and Hydrological impact, ADVANCES IN ATMOSPHERIC SCIENCES 32:64–91; Arctic Monitoring and Assessment Programme (AMAP) (2017) ADAPTATION ACTIONS FOR A CHANGING ARCTIC: PERSPECTIVES FROM THE BARENTS AREA; International Energy Agency (IEA) (2016) WORLD ENERGY OUTLOOK SPECIAL REPORT: ENERGY AND AIR POLLUTION; World Bank & International Cryosphere Climate Initiative (2013) ON THIN ICE: HOW CUTTING POLLUTION CAN SLOW WARMING AND SAVE LIVES.; Shindell D. & Faluvegi G. (2009) Climate response to regional radiative forcing during the twentieth century, Nature Geoscience 2:294–300.</p>	<p>Rejected. Avoided warming associated with SLCP removal is beyond the scope of Ch4 (and of WG3). Will make point by providing reference to relevant chapter in WG1</p>	Durwood Zaelke	Institute for Governance & Sustainable Development	United States of America
32443	41	17	41	36	<p>While not GHGs, black and brown carbon aerosols also are important climate forcers and comes from some similar sources that should be considered part of this discussion. While organic carbon is reflective, the warming effect of black and brown carbon components overall amplify warming. Black carbon is a powerful climate-warming aerosol that directly warms the atmosphere by absorbing solar radiation and indirectly by darkening snow and ice surfaces. Nearly 90% of black carbon emissions come from residential solid fuels, diesel engines, and residential coal; the rest of the emissions come from aviation, shipping, and flaring. Reducing black carbon is especially beneficial for the Arctic because black carbon not only warms the atmosphere but also facilitates additional warming. Once black carbon is deposited on the snow and ice, it reduces the reflectivity (albedo) and absorbs extra solar radiation, which leads to further melting than pristine snow and ice. Since 1890, black carbon has contributed about 0.5–1.4 °C of warming to the Arctic. Bond T. C., et al. (2013) Bounding the role of black carbon in the climate system: A scientific assessment, J. GEOPHYSICAL RESEARCH–ATMOSPHERES 118(11):5380–5552; Myhre G., et al. (2013) CHAPTER 8: ANTHROPOGENIC AND NATURAL RADIATIVE FORCING, in IPCC (2013) CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Table 8.A.6; Qian Y., et al. (2014) Light-absorbing Particles in Snow and Ice: Measurement and Modeling of Climatic and Hydrological impact, ADVANCES IN ATMOSPHERIC SCIENCES 32:64–91; Arctic Monitoring and Assessment Programme (AMAP) (2017) ADAPTATION ACTIONS FOR A CHANGING ARCTIC: PERSPECTIVES FROM THE BARENTS AREA; International Energy Agency (IEA) (2016) WORLD ENERGY OUTLOOK SPECIAL REPORT: ENERGY AND AIR POLLUTION; World Bank & International Cryosphere Climate Initiative (2013) ON THIN ICE: HOW CUTTING POLLUTION CAN SLOW WARMING AND SAVE LIVES.; Shindell D. & Faluvegi G. (2009) Climate response to regional radiative forcing during the twentieth century, Nature Geoscience 2:294–300; Feng Y., et al. (2013) Brown carbon: a significant atmospheric absorber of solar radiation?, ATMOS. CHEM. PHYSICS 13:8607–8621.</p>	<p>Rejected. Climate impacts of black and brown carbon is beyond the scope of WG3. Will make point by providing reference to relevant chapter in WG1</p>	Durwood Zaelke	Institute for Governance & Sustainable Development	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
32785	41	17	41	36	With SLCs providing avoided warming at 2050 of up to 0.6 °C and CO2 avoiding up to 0.1–0.3 °C; at 2100, SLCs avoid 1.2 °C warming and CO2 avoids 1.6–1.9 °C. SLC reductions are critical for vulnerable areas like the Arctic and because they can slow progression of tipping points and self-reinforcing feedbacks. See Xu and Ramanathan (2017) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, Proc. Natl. Acad. Sci. 114(39):10315–10323; Ramanathan and Xu (2010) The Copenhagen Accord for limiting global warming: Criteria, constraints, and available avenues, Proc. Natl. Acad. Sci. 107(18):8055–8062; Ramanathan and Feng (2008) On avoiding dangerous anthropogenic interference with the climate system: Formidable challenges ahead, Proc. Natl. Acad. Sci. 105(38):14245–14250; Ramanathan, Molina, and Zaelke (2017) Well Under 2 Degrees Celsius: Fast Action Policies to Protect People and the Planet from Extreme Climate Change. Reducing black carbon is especially beneficial for the Arctic because black carbon not only warms the atmosphere but also facilitates additional warming. Once black carbon is deposited on the snow and ice, it reduces the reflectivity (albedo) and absorbs extra solar radiation, which leads to further melting than pristine snow and ice. Since 1890, black carbon has contributed about 0.5–1.4 °C of warming to the Arctic. Bond T. C., et al. (2013) Bounding the role of black carbon in the climate system: A scientific assessment, J. GEOPHYSICAL RESEARCH-ATMOSPHERES 118(11):5380–5552; Myhre G., et al. (2013) CHAPTER 8: ANTHROPOGENIC AND NATURAL RADIATIVE FORCING, in IPCC (2013) CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Table 8.A.6; Qian Y., et al. (2014) Light-absorbing Particles in Snow and Ice: Measurement and Modeling of Climatic and Hydrological impact, ADVANCES IN ATMOSPHERIC SCIENCES 32:64–91; Arctic Monitoring and Assessment Programme (AMAP) (2017) ADAPTATION ACTIONS FOR A CHANGING ARCTIC: PERSPECTIVES FROM THE BARENTS AREA; International Energy Agency (IEA) (2016) WORLD ENERGY OUTLOOK SPECIAL REPORT: ENERGY AND AIR POLLUTION; World Bank & International Cryosphere Climate Initiative (2013) ON THIN ICE: HOW CUTTING POLLUTION CAN SLOW WARMING AND SAVE LIVES.; Shindell D. & Faluvegi G. (2009) Climate response to regional radiative forcing during the twentieth century, Nature Geoscience 2:294–300.	Rejected. Climate impacts of SLCs is beyond the scope of Ch4 (and of WG3). Will make point by providing reference to relevant chapter in WG1	Kristin Campbell	Institute for Governance & Sustainable Development	United States of America
36691	41	19	41	22	The source of this sentence "In Asia especially, co-benefits of drastic CO2 mitigation measures..." is not clear. Is this based on one study or assessed from a group of studies? Please provide reference.	Accepted. Text revised.	Vaishali Naik	NOAA GFDL	United States of America
13485	41	19	41	23	In Hanaoka and Masui, the case with climate mitigation also includes air quality mitigation (EoP in the name of their simulation) which in the case of Eopmax over Asia represents half of the reduction. The sentence here is thus confusing.	Accepted. Text revised.	Sophie Szopa	Commissariat à l'Energie Atomique et aux Energies Alternatives	France
12687	41	20	41	21	Reduction of sulphur dioxide and nitrogen oxide will not produce co-benefit (for climate) in the context here, as weakened sulfate formation and prolonged CH4 lifetime will counteract, while the reduction will improve air quality. Such non-simplicity should be at least briefly mentioned.	Accepted. Text revised.	Yugo Kanaya	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	Japan
28041	41	24	41	26	IPCC states, "Rapid SLCP reductions, specifically of methane, black carbon, and tropospheric ozone, have immediate co-benefits including meeting sustainable development goals for reducing health burdens of household air pollution and reversing health- and crop-damaging tropospheric ozone." This conclusion was first shown in Jacobson, M. Z., Control of fossil-fuel particulate black carbon plus organic matter, possibly the most effective method of slowing global warming, J. Geophys. Res., 107 (D19), 4410, doi:10.1029/2001JD001376, 2002 and was shown further in Jacobson, M.Z., Short-term effects of controlling fossil-fuel soot, biofuel soot and gases, and methane on climate, Arctic ice, and air pollution health, J. Geophys. Res., 115, D14209, doi:10.1029/2009JD013795, 2010. Please include these references, as the first in particular is the original paper linking climate change mitigation with reduced health problems from air pollution.	Noted. Will consider the proposed reference.	Mark Jacobson	Stanford University	United States of America
36693	41	26	41	28	Are there no newer studies since Shindell et al (2012) quantifying the health impacts regional SLCF mitigation?	Accepted. Will look for more recent references	Vaishali Naik	NOAA GFDL	United States of America
36695	41	30	41	31	Which existing studies?	Accepted. Will provide reference	Vaishali Naik	NOAA GFDL	United States of America
27539	41	31	41	33	Need a reference to black carbon mitigation studies.	Accepted. Will provide reference	William Collins	University of Reading	United Kingdom (of Great Britain and Northern Ireland)
36697	41	31	41	33	References are needed here.	Accepted. Will provide reference	Vaishali Naik	NOAA GFDL	United States of America
24101	41	42	41	45	The meaning of this sentence is not clear.	Accepted. Will clarify.	Alfred Oforu Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana
30205	41	43	41	44	It is important to scrutinise the baseline assumptions in this assessment, because I suspect that for the higher temperature impacts the baseline assumptions are unrealistic.	Accepted. Will qualify the baseline assumptions in this assessment.	Bert Metz	European Climate Foundation	Netherlands

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20913	41	16	42	12	Titles of subsections in 4.2.5.3 would better be changed, except for 4.2.5.3.1 "Lowering Demand, Downscaling Economies". The titles of 4.2.5.3.3&4 could be changed to be similar to that of 4.2.5.3.1 "Lowering Demand...". Not sure if it is adequate to include 4.2.5.3.5 "Lack of cost and co-benefit estimates" under the section 4.2.5.3 that discusses "opportunities to accelerate the scale and pace of mitigation". At least, its title needs to be changed.	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
13489	41	37	42	4	Could you please discuss the realism of the various baselines and deployment of the Kigali amendment scenario. It's a bit discussed in WG1 chapter 6 (sections 6.5 and 6.6+ executive summary of the SOD) but a discussion from the WG3 point of view discussing the robustness/realism of the scenarios would help.	Accepted. Text revised.	Sophie Szopa	Commissariat à l'Energie Atomique et aux Energies Alternatives	France
19783	41	37	42	4	It is mentioned the Kigali Amendment to the Montreal Protocol for climate change protection reducing the HFCs emitted, but the reality is that refrigeration and air conditioning systems in many developing countries are still based on CFCs and HCFCs (like R-12 or R22). Moreover, today, this Protocol has not been ratified by many countries, including some of the most emitting parties (the USA, Russia, China, Brazil, India), only Europe has approved a regulation to control HFCs.	Accepted. Text revised.	Adrián Mota-Babiloni	University Jaume I of Castellon	Spain
36699	41	45	42	1	Can examples be provided of "commercially available low-GWP alternatives"?	Accepted. Example included.	Vaishali Naik	NOAA GFDL	United States of America
20883	41	22			A period in a wrong place: 2020. levels -> 2020 levels.	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
30207	42	5	42	9	I do not believe this is true. There should be more literature on this, particularly in chapter 3.	Noted. Will look for additional literature on costs.	Bert Metz	European Climate Foundation	Netherlands
881	42	6	42	9	Only a few studies have evaluated total costs and co-benefits of mitigations. In addition, information is lacking on societal and environmental costs. These are weaknesses for assessing mitigation pathways and should be discussed more thoroughly in this section of the chapter.	Noted. Will look for additional literature on costs.	Michael Kennish	Rutgers University	United States of America
46407	42	14	42	14	The 2030 Agenda and the SDGs are mentioned here and there. But it is rather scattered. I think the chapter (especially since it is about the near term) should have a much more thorough discussion about the Agenda and its relation to mitigation. One particular interesting aspect is potential synergies and trade-offs between mitigation and this much broader Agenda. Central to the 2030 Agenda, and a distinguishing feature as compared to other sustainability initiatives, is that it is intended to be treated as universal and indivisible. Universality implies that the 2030 Agenda applies to all nations and actors around the globe, regardless of current level of income or sustainability challenges. The principle of indivisibility means that the implementation of the Agenda should be based on integrated approaches rather than on siloed knowledge and policy-making, these are important perspectives that could more clearly be linked to a broader mitigation agenda. Key publications here include Nilsson M, Griggs D, Visbeck M (2016) Map the interactions between sustainable development goals. Nature 534, 320–322. Pedercini, M., Arquitt, S., Collste, D., Herren, H. (2019), "Harvesting synergy from sustainable development goal interaction", Proceedings of the National Academy of Sciences 116, 23021-23028. Pradhan, P., Costa, L., Rybski, D., Lucht, W., Kropp, J.P. (2017), "A Systematic Study of Sustainable Development Goal (SDG) Interactions", Earth's Future 5, 1169-1179. Weitz, N., Carlsen, H., Nilsson, M., Skånberg, K. (2018), "Towards systemic and contextual priority-setting for implementing the 2030 Agenda" Sustainability Science 13, 531-548.	Noted. The 2030 Agenda and the SDGs are introduced in Ch1, and the interactions between mitigation and the SDGs are discussed in Ch17. The framing of the SDGs, however, is used to map sustainability issues in Ch4. And the interactions between mitigation and development priorities are already discussed in sections 4.3 and 4.4. Also, will assess the proposed references.	Henrik Carlsen	Stockholm Environment Institute	Sweden
20885	42	14	42	44	Surprisingly, citations are not included at all while various definitions of development pathways in the literature are discussed.	Accepted. Citations added.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
27767	42	5	43	12	Does this paragraph belong here?	Taken into account. Discussion on costs to be expanded in chapter.	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
46409	43	1	43	12	Cf. Comment above on qual storylines.	See answer to comment #46394	Henrik Carlsen	Stockholm Environment Institute	Sweden
24103	43	5	43	5	Development pathways, scenario etc have been defined in Chapter 3. There is a need to coordinate the chapters to avoid duplication of definitions to reduce the volume of the report.	Rejected. "Development pathways" are part of Ch4 title and should thus be defined separately. Definition to be revised based on x-chapter discussions and glossary.	Alfred Ofori Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana
46411	43	15	43	15	Table 4.6: The SSPs "... Uncertainty range found in the scenario literature". I don't think so. This was the task of the SRES and the RCP, but the SSPs??	Noted. Sentence in Table 4.6 referred to range of uncertainty on socio-economic conditions (baselines)	Henrik Carlsen	Stockholm Environment Institute	Sweden
7031	43	15	43	16	In Table 4.6 it may be useful to summarize (in another column, after the notes?) the purpose of each of the development pathway projects, e.g. the purpose of the DDP was to demonstrate the feasibility of a global, nationally grounded mosaic of development pathways to reach a 50% chance of 2C in the pre COP21 context.	Noted. Table 4.6 will be largely revised in SOD.	CHRISTOPHER BATAILLE	IDDR.ORG/SIMON FRASER UNIVERSITY	Canada
36235	43				The development pathways in the table are the climate change mitigation related. Many others exist and this should be explained to the readers	Accepted. Table 4.6 will be largely revised in SOD to include pathways designed with other issues than mitigation in mind.	Youba Sokona	South Centre	Switzerland
37937	44	7	44	46	The SDGs focus on equity, not just equality -- that is, equitable outcomes, not just equality in income / wealth. Most models don't adequately address this, due partly to data limitations, but this shortcoming should be noted. Structural inequities are even more pervasive and hard to unseat than structural inequality.	Rejected. Point well taken, but unclear what part of p.44 lines7-46 should be modified.	Patricia Perkins	York University	Canada
46413	44	12	44	12	Define 'transformative change'.	Accepted. Text revised.	Henrik Carlsen	Stockholm Environment Institute	Sweden

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44927	44	16	44	25	4.3.1.2 Shifting development pathways. Include biodiversity loss and ecosystem degradation and collapse in the multiple sustainability challenges.	Accepted. Text revised.	Virginia Young	Australian Rainforest Conservation Society, Griffith University, CAN Ecosystems	Australia
36701	44	17	44	17	"protecting the ozone" is odd. Do you mean "protecting the stratospheric ozone layer"?	Editorial – copyedit to be completed prior to publication	Vaishali Naik	NOAA GFDL	United States of America
46415	44	19	44	20	Cf. Comment no. 29	Rejected. Unclear what comment #29 is.	Henrik Carlsen	Stockholm Environment Institute	Sweden
39223	44	22	44	23	Unclear sentence. Is this referring to the need of integrated approaches when addressing multiple sustainability aspects?	Accepted. Text revised.	Diego Silva Herran	National Institute for Environmental Studies	Japan
16087	44	32	44	34	Need consistent use of terminology and concepts: Is policy an enabling condition or not? In line 26 it is listed as such, but this sentence suggests it is distinct from though related to enabling conditions. We grapple with some of these terminological issues in Ch 13 as well.	Taken into account. Status of "policy" in enabling conditions to be clarified in Ch4.	Navroz Dubash	Centre for Policy Research	India
46417	44	32	44	35	Strange statement. Almost tautology.	Accepted. Text made clearer.	Henrik Carlsen	Stockholm Environment Institute	Sweden
19881	44	41	44	43	There should be reference to UN my world, which shows much higher priority on education, health and job compared with climate change. http://data.myworld2015.org/	Noted. Will assess proposed reference.	Takahiko Tagami	Institute of Energy Economics, Japan	Japan
20893	44	36	56	7	In sections 4.3.2 - 4.3.4, in many cases where two or more references are cited in a row, there are redundant parentheses.	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20887	44	27			Figure 4.5 -> Figure 4.9	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
36237	44	37		46	You seem to use alternatively development priorities and SDGs. SDGs are helpful to making development more sustainable and they are not adopted as development priority elements. Could you please make clearly the distinction and the linkages between development priorities and SDGs	Accepted. Text revised.	Youba Sokona	South Centre	Switzerland
35867	45	1	45	3	Any new data available?	Noted. Figure to be updated, data permitting.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
27769	45	1	45	4	There are serious problems here. The numbers are severely wrong: According to the US Census households (AND NOT INDIVIDUALS) in the lowest quintile (20th percentile) had incomes of \$25,600 or less in 2018! The monetary outcome is not a very good measure of poverty, adjusted incomes (for example, according to purchasing power) are better although insufficient metrics. The first sentence relates to international income comparisons. It concludes ("As a result", second sentence) that redistribution within a nation is a must. This does not make any sense. Etc. The whole sub-section would benefit of being deeply revised.	Accepted. Text revised.	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
30209	45	1	45	6	This is too general about inequality. For this report the focus should be how inequality affects GHG pathways and adaptation to climate change. That is not discussed at all.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
30211	45	6	45	8	This description of India's development priorities is meaningless, unless the relationship between development priorities and mitigation and adaptation is analysed.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
30213	45	8	45	9	This is a useless descriptive sentence. What would be more relevant is to analyse how these development priorities help or hinder effective mitigation and adaptation. Is it true that focussing on eradicating poverty cannot go hand in hand with moving towards a low carbon society?	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
30215	45	10	45	15	This paragraph gives a hint that development priorities can go hand in hand with moving towards a low carbon society; this is a most interesting issue for policy makers, but then this issue requires a much deeper analysis. You cannot deal with such a critical issue in a few sentences and based on very limited literature.	Taken into account. Impact of development priorities on mitigation is central purpose of 4.3.2. Section revised to discuss these links more in-depth.	Bert Metz	European Climate Foundation	Netherlands
37939	45	12	45	15	"Inequity" seems to be what is meant here, since education and employment access are mentioned; inequity is even more related to mitigation outcomes than inequality.	Accepted. Text revised.	Patricia Perkins	York University	Canada
30217	45	26	45	39	This paragraph does not analyse the relationship between development plans and mitigation/adaptation, which is supposedly what this section is meant to do. Just listing the initiatives that promoted the adoption of national plans is not what this section should cover. If an introduction to development plans is considered necessary, then shorten this considerably.	Taken into account. Impact of development priorities on mitigation is central purpose of 4.3.2. Section revised to be less descriptive and discuss these links more in-depth.	Bert Metz	European Climate Foundation	Netherlands
16089	45	28	45	28	India dispensed with its formal 5 year plan process in 2014	Noted.	Navroz Dubash	Centre for Policy Research	India
36245	45	16	46	15	It is strange that you did not mention at all the "Poverty Reduction Strategy Programs" and the MDGs and their motivation linked to the Structural Adjustment Programs	Noted.	Youba Sokona	South Centre	Switzerland
35869	45	41	46	27	The New India thing looks very overhyped. There are many important policies of including the National Action Plan on Climate Change 2008 which includes important missions like National Solar Mission and initiatives like Perform, Achieve and Trade which is driving the emissions intensity NDC target of India. For more information, please see: https://unfccc.int/sites/default/files/resource/INDIA%20SECOND%20BUR%20High%20Res.pdf	Noted. Will assess proposed reference.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
20889	45	16	47	15	Any reason why the author(s) selected China, India and South Africa development plans, specifically? If possible, more examples of other countries can be added during the SOD process.	Noted. These countries have national development plans, relevant to the discussion of shifting development pathways in the chapter. Will look for other examples and suggestions welcome	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
36239	45	3			Could please elaborate how in those mentioned countries reducing inequality is a priority? And even poverty?	Accepted. Text revised.	Youba Sokona	South Centre	Switzerland
36241	45	20			It is worth mentioning here that developing countries have been imposed under the structural adjustment program stopping any planning with the big push for liberalism and privatisation. It is only recently many countries have start gain the planning with a Minister dedicated	Accepted. Will expand briefly on history of planning.	Youba Sokona	South Centre	Switzerland

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
36243	45	22		24	Could you please give any reference as I did not come across any comeback to planning motivated by the implementation of the SDGs	Accepted. Will qualify statement (SD agenda has spurred increased interest in mid-term forecasting), and will provide reference	Youba Sokona	South Centre	Switzerland
36247	45	24		25	It is preferable to have various categories of countries (emerging economy, mid-income, LDCs) rather only those 3 countries in the boxes	Taken into account. Section will be revised, with emphasis on broader range of countries.	Youba Sokona	South Centre	Switzerland
38799	45	28			Soviet Union is an antiquated term that refers to the former USSR that existed from 1922 to 1991. Is this sentence about moving away from national development plans referring to those during the Soviet era (i.e., pre-1991)? Or is Soviet Union referring to modern-day Russia? In any case, there should be a temporal dimension as to clarify which nation state during which time period.	Accepted. Text revised.	Julian Reyes	Personal Capacity	United States of America
18497	46			46	national development plans: national, local and sectoral ones. some countries do and some countries do not. In China, climate targets are included and specified for implementation. 14th five year plan in China is on the making.	Noted.	Jiahua Pan	Chinese Academy of Social Science	China
20891	46	29			Check and edit the title of Box 4.2	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
16093	47	29	27	37	This first sentence is a bit bald, and some nuance might help invite more into the conversation. In many developing countries, this would appear to be prima facie true. In addition, however, the sentence becomes more generally applicable if 'development' is defined in a broad way. The point is that development pathway choices, made for a range of reasons, have mitigation implications. But these choices are unlikely to be made for mitigation reasons alone. Hence, internalising mitigation as part of larger development conversations holds promise. This leads to the language of multiple objectives, which might be useful to introduce here, and also links to CH 1. It might also be good to broaden the reference base for this section. A potentially useful citation might be Bhardwaj et al (https://www.sciencedirect.com/science/article/pii/S221462961830611X)	Accepted, text revised. We agree that first sentence should be more broadly supported. We need to spell out that development is not only for developing countries. Will review proposed reference	Navroz Dubash	Centre for Policy Research	India
37265	47	17	47	17	This section could benefit by making it explicit that for many countries, climate change interventions are likely to be realised if mainstreamed within development plans.	Accepted. This is really the point. Will make it clearer.	Michiel Schaeffer	Climate Analytics	Netherlands
7033	47	17	47	28	This is an excellent set of paragraphs (4.3.2.3 in general is very important) that may belong nearer the beginning, as in a way they summarize the purpose of Ch4	Taken into account. Thanks, but we prefer to keep flow of Ch4 to unchanged, yet take the point and will highlight in executive summary (to be written).	CHRISTOPHER BATAILLE	IDDR.ORG/SIMON FRASER UNIVERSITY	Canada
30219	47	18	47	19	This sounds as a criticism of looking at stabilisation of GHG concentrations, while that is the heart of SDG13 on climate. This is a non-statement that should be dropped.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
16091	47	23	47	26	It might be worth pointing out that while this directionality pervaded the early research, later research posited a bi-directional relationship, leading to the concept of multiple objectives. Bhardwaj et al (https://www.sciencedirect.com/science/article/pii/S221462961830611X)	Accepted. Text revised. Will review proposed reference.	Navroz Dubash	Centre for Policy Research	India
37009	47	24	47	25	This misses the point that development drives	See response to comment #37009	Joyashree Roy	Asian Institute of Technology, Thailand. Jadavpur University, India	Thailand
37011	47	24	47	25	"This misses the point that development drives "... as is now ; poses some confusion conceptually with the environmental economics literature which says new economic activities can be targeted which can be mitigation/ environmental externality reducing which are intended towards environmental good supply and can thus emission reduction activity can drive development.	Taken into account. That mitigation activities can have positive externalities for other dimensions of development does not contradict the idea that the mitigation space is largely determined by development choices. Will make point clearer in text.	Joyashree Roy	Asian Institute of Technology, Thailand. Jadavpur University, India	Thailand
37013	47	27	47	28	"Also while ...trade offs" Reference to SR1.5 can be added and it means that while previous sentence says adaptation-mitigation both needs to be considered this may be a good place to do similar exercise with advancements for adaptation as well. So WGIII handshakes table/graph/analysis can fit in here very well.	Rejected. General point taken, but this is a sub-section explicitly on development pathways and emissions. We can point ahead to 4.5, where a link to WG2 would work better in our structure	Joyashree Roy	Asian Institute of Technology, Thailand. Jadavpur University, India	Thailand
43695	47	29	47	37	Examples are all around economic growth. Can some examples also focus on wellbeing, service provisionings, and decent living standards directly?	Accepted. Text revised.	Felix Creutzig	MCC Berlin	Germany
37015	47	34	47	35	It seems this can cross reference ch 5 also lines 42-43 is in line with what ch 5 is saying	Accepted. Text revised.	Joyashree Roy	Asian Institute of Technology, Thailand. Jadavpur University, India	Thailand
30221	47	38	47	42	This is a complicated sentence that lists a number of elements of sustainable and climate inclusive development plans. The selection of elements is a bit strange, as the more obvious ones, like energy and resource efficiency, shifting to renewable energy sources, sustainable and nature inclusive agriculture, forest protection, etc are not mentioned at all	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
46419	47	17	48	11	I don't know where to put this comment, but anyway: I don't see the SPAs anywhere in the text.	Noted. Will review proposed reference.	Henrik Carlsen	Stockholm Environment Institute	Sweden
36249	47	17		45	Here is missing sustainable development as the 3 (Development/sustainable development/climate change) are different and interlinked	Taken into account. Links between development, sustainable development and mitigation to be discussed in x-chapter box in SOD.	Youba Sokona	South Centre	Switzerland
30223	48	1	48	8	This is a nice academic way to discuss the relationship between development pathways and managing climate change, but it is of very limited relevance to policy makers. What I want to see is a more in-depth analysis of how development plans should be designed in order to maximise managing climate change to meet the Paris goals. A comparison of country development plans and climate outcomes would be very useful.	Taken into account. Boxes 4.1 to 4.3, just before this paragraph, outline three country development pathways. Will look for more example and compare. However, comparison of individual countries in IPCC is sensitive. We disagree that current text is not policy-relevant, when read in context	Bert Metz	European Climate Foundation	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
11421	48	12	48	42	The whole section 4.3.2.4 'Drivers of CO2 emissions' is patchy and uses out of date literature. I suggest to simply here refer to Chapter 2, Section 2.4 'Economic and socio-demographic drivers and their trends'. This includes economic and socio-demographic drivers, including trade, urbanisation and inequality.	Accepted, text revised and linked to Ch2	Thomas Wiedmann	UNSW	Australia
24977	48	12	48	42	Analysis presented in sub-section 4.3.2.4 to be consistent with analysis presented in previous chapters, avoiding repetitions	Accepted, text revised and linked to Ch2	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
30225	48	15	48	42	Just listing several studies with their conclusions does not make a good assessment. It should be possible to present a comprehensive picture of the drivers for the global economy (GDP growth leads to higher CO2, but at high GDP some countries have shown that a decoupling is possible). IEA and previous IPCC reports have presented such analysis, including the role of population, carbon intensity, etc. regional deviations from this global picture could illustrate some interesting features of countries' development strategies.	Accepted, text revised and linked to Ch2	Bert Metz	European Climate Foundation	Netherlands
20895	48	18	48	23	Parentheses should be removed when the subject of the sentence is a reference.	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
10249	48	27	48	28	Unclear what does 'global panel' mean?	Accepted. Text revised.	Aglaia Obrekht	Environment and Climate Change Canada	Canada
704	48	27	48	32	This paragraph strikes me as a somewhat selective discussion of a large literature on the drivers of CO2 emissions, in particular the role of economic development. The text should provide a more balanced representation of the evidence to date. In particular, I think that multiple contributions find that economic growth may result in a lower emissions intensity of output (emissions per \$ of GDP) but not necessarily in lower overall emissions. This is shown, among others, by Raupach et al. (PNAS, Vol. 104, 2007) as well as Shapiro and Walker (American Economic Review, Vol. 108, 2018).	Accepted, text revised and linked to Ch2	Lutz Sager	Georgetown University	United States of America
12777	48	36	48	36	Unexpected 'l'	Editorial – copyedit to be completed prior to publication	antoine leblois	INRA	France
706	48	36	48	42	This paragraph does well in discussing how the degree of economic inequality may influence aggregate greenhouse gas emissions. In particular, it cites the evidence from aggregate-level correlations (as surveyed in Berthe and Elie, 2015). But it should also mention recent micro-level evidence on this "equity-pollution dilemma" provided by Sager (Energy Economics, Vol. 84, 2019). Sager (Energy Economics, Vol. 84, 2019) estimates that the inequality-emissions relationship is rather small--reducing income inequality in the United States would only raise consumption-based CO2 emissions slightly (+2.3% in CO2 emissions when moving to full income equality).	Noted. Will assess proposed references	Lutz Sager	Georgetown University	United States of America
10251	48	44	48	44	Unclear what does 'higher quality growth' mean in this context? Quality of what? Or does it refer to equality?	Accepted. Text revised	Aglaia Obrekht	Environment and Climate Change Canada	Canada
16229	48	12			In Section 4.3.2.4 Drivers of CO2 emissions, consider including a description of global military GHG emissions based on nationalisms as a relevant driver of CO2 emissions, for accuracy and clarity.	Rejected. Detailed discussion of the drivers of emissions is task of Ch2	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
20897	48	36			"l" mark after "climate change mitigation" should be removed.	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20899	48	43			The title does not seem to reflect the contents of the section 4.3.2.5.	Noted. Will consider changing after section revision.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
30227	49	1	49	1	As commented on above,, the chapter has not demonstrated how reducing inequality helps to manage climate change	Taken into account. Link between inequality and climate mitigation will be made clearer in SOD	Bert Metz	European Climate Foundation	Netherlands
30229	49	1	49	3	This sentence is way too abstract to be of use to policy makers	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
30231	49	6	49	8	More is needed on the relation between development plans and climate resilience. One sentence is not enough. With country specific examples please.	Accepted. Will expand.	Bert Metz	European Climate Foundation	Netherlands
7035	49	9	49	10	Undeveloped fragment. What does it mean that "climate policy is not a self-control mechanism in the development system"? For "methods that back from development goals" I suggest the already cited Waisman et al (2019), which discusses backcasting in the context of co-planning to meet climate and development goals. E.g. "Waisman et al 2019 document the narrative and scenario formation methodology used to backcast climate and development goals in the 2014-2015 Deep Decarbonization Pathways project (Bataille et al 2016a), and consider broader applications for a wider range of development goals".	Accepted. Text revised.	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNNIVERSITY	Canada
30233	49	9	49	10	What does this sentence mean?	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
30235	49	11	49	26	This is too general and abstract. A more detailed analysis is needed , using country cases, to make this operational for policy makers.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
16095	49	20	49	22	May be worth citing Cohen et al. https://www.researchgate.net/publication/323563401_Multi-criteria_decision_analysis_in_policy-making_for_climate_mitigation_and_development	Noted. Will review proposed reference	Navroz Dubash	Centre for Policy Research	India
37233	49	43	50	6	This section described the impacts of mitigation efforts on GDP, but does not address the broadly agreed benefits on GDP to climate action through avoided impacts, loss & damage, etc.	Rejected. The purpose of this section is not to discuss the benefits of mitigation. Benefits to be acknowledged though, with references to WG2 and to Ch3 (section 3.6)	Michiel Schaeffer	Climate Analytics	Netherlands
883	49	44	50	6	For the series of countries noted, mitigation modeling studies indicate negative impacts of mitigation on GDP in 2030 and 2050. It is difficult to predict how these modeling studies will be received by political leaders in each country, and if there will be pushback to implement mitigation actions as a result.	Taken into account. Section to be revised with additional references, proper discussion of uncertainty, and mention of benefits associated with mitigation (in terms of avoided damages, not accounted for in the studies mentioned here)	Michael Kennish	Rutgers University	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30237	49	44	52	27	This is misleading for 2 reasons: 1) there are several countries/ regions (USA, EU) that have shown considerable increases in GDP, combined with a reduction in GHG emissions. That goes directly against the conclusion presented here; 2) there are no numbers given for the lost GDP growth. Previous IPCC assessments have clearly shown that the lost GDP is very limited. More importantly, this kind of analysis is ignoring the strong message from the previous section that an integrated development approach is needed aiming to deliver SDGs and the Paris goals on climate. In such a context it is utterly unhelpful to say that climate mitigation leads to GDP loss. The real issue is: how to maximise welfare, while delivering SDGs and climate goals.	Rejected. (a) The mitigation pathway literature points in general to GDP losses associated with very 'basic' mitigation (you constrain GHG emissions, you do much else). However, figures will be made more visible (percentage loss are indicated on y axis of figure). This does not contradict the fact that combining constraints on emissions with other measures (see Fiscal reform in 4.4.1) can mitigate economic costs.	Bert Metz	European Climate Foundation	Netherlands
11423	49	43	54	4	Section 4.3.3.2 'Mitigation and economic growth in the short- and medium-term': Given that absolute decoupling (of GHG emissions from economic growth) has been very limited so far, a substantial strand of the (ecological economics) literature has discussed the necessity of "degrowth" or "a-growth" approaches, i.e. economic policies that are not focused on economic growth but on a managed reduction of environmental impacts. This is an important part of the sustainability transition literature/discussion which should be discussed here (or in other sub-sections of Chapter 4). Key references include: van den Bergh, J. C. J. M. (2017) A third option for climate policy within potential limits to growth. Nature Climate Change, 7(2), 107-112. https://www.nature.com/articles/nclimate3113 Cosme, I., Santos, R. and O'Neill, D. W. (2017) Assessing the degrowth discourse: A review and analysis of academic degrowth policy proposals. Journal of Cleaner Production, 149, 321-334. http://dx.doi.org/10.1016/j.jclepro.2017.02.016 Costanza, R., Kubiszewski, I., Giovannini, E., Lovins, H., McGlade, J., Pickett, K. E., Ragnarsdóttir, K. V., Roberts, D., Vogli, R. D. and Wilkinson, R. (2014) Time to leave GDP behind. Nature, 505, 283-285. http://www.nature.com/news/development-time-to-leave-gdp-behind-1.14499?WT.ec_id=NATURE-20140116 Jackson, T. (2017) Prosperity without Growth - Foundations for the Economy of Tomorrow. 2nd Edition. Earthscan, London, UK. https://timjackson.org.uk/ecological-economics/pwg/ ; https://www.routledge.com/Prosperity-without-Growth-Foundations-for-the-Economy-of-Tomorrow-2nd/Jackson/p/book/9781138935419 Weiss, M. and Cattaneo, C. (2017) Degrowth – Taking Stock and Reviewing an Emerging Academic Paradigm. Ecological Economics, 137, 220-230. http://www.sciencedirect.com/science/article/pii/S0921800916305900 Victor, P. A. (2019) Managing without Growth - Slower by Design, not Disaster. Second Edition. Advances in Ecological Economics. Edward Elgar, Cheltenham, UK, Northampton MA, USA. https://doi.org/10.4337/9781785367380 , https://www.e-elgar.com/shop/managing-without-growth-second-edition Büchs, M. and Koch, M. (2018) Challenges for the degrowth transition: The debate about wellbeing.	Taken into account. De/A-growth literature will be reviewed in section 4.3 (though possibly not in 4.3.3), with proper mentions to other chapters. Will review proposed references.	Thomas Wiedmann	UNSW	Australia
35627	49	43			It is important that the limitations of these studies are described. For example, are benefits and co-benefits included etc.	Accepted, text revised.	Göran Finnveden	KTH Royal Institute of Technology	Sweden
35629	49	43			This text should be linked to corresponding text in Chapter 3	Accepted. Text revised.	Göran Finnveden	KTH Royal Institute of Technology	Sweden
37235	49	43			This section could benefit from an explanation of the shortcomings of using GDP as a measure of economic well-being, e.g. the lack of valuation of co-benefits (e.g. reduced air pollution, increased biodiversity)	Accepted. Text revised	Michiel Schaeffer	Climate Analytics	Netherlands
20901	50	5	50	6	Figure 4.4b does not explicitly show that GDP continues to grow with mitigation in all simulation cases. Most of the lines in Panel b merely show both emissions and GDP increase. Is the emission levels "with existing mitigation measures"? More detailed information and explanation for Figure 4.4 is needed for clarification.	Accepted. Text revised	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
24105	51	1	51	7	The graph showing GDP and Emissions could tell the story better if the true values had been used to plot the graph. That is a negative fit/figure should appear in the THIRD quadrant to show the NEGATIVE figures. Minus 100% and minus 12% cannot be in the first quadrant.	Accepted. Text revised	Alfred Ofosu Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana
20903	51	1	51	8	Further information is needed on "which simulation(or study)" each point is from, and "what country" each point represents.	Noted. Figure 4.4. will be revised and adding more information on country/study will be considered. It may, however, be infeasible for readability issues.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
10843	51		51		Figure 4.4 compares GDP and emissions. Though this is interesting this doesn't explain why and how this has happened. If this chapter wish to retain this type of figures, analysis based on the well-known KAYA IDENTITY will tell readers more useful insights. By doing this way, we know what factors, such as energy efficiency improvement, de-carbonization, GDP or population, are the main cause of change of the relationship between GDP and emissions.	Taken into account. Text revised to better capture mechanisms linking GDP and emissions, with links to relevant other chapters	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan
34729	51	3			It is expected that descriptions on investment and economic implications for the national scenarios will be extended in the SOD. In this regard, I am worried that the policy cost variables (e.g. Policy Cost Additional Total Energy System Cost, Policy Cost GDP loss) are missing in the variable list of current national scenario template for AR6 database, unlike the global-sectoral template.	Noted. GDP and total energy system costs are within AR6 scenario database. Whether scenarios will feed it in is another question.	Ken Oshiro	Kyoto University	Japan

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Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
10845	52	1	52	11	Citing several literatures analyzing GDP losses or carbon price (MAC) would be useful here as GDP losses are discussed here.	Taken into account. Will consider adding information on abatement costs	Mitsutsune Yamaguchi	Research Institute of Innovative Technology for the Earth	Japan
16097	52	1	52	27	This is a somewhat lengthy theoretical explanation. It could usefully be shortened.	Accepted. Text revised.	Navroz Dubash	Centre for Policy Research	India
10253	52	12	52	15	The rigidities in the short term would only be "triggered" because of mitigation? If so, it is unclear why would they change the GDP in the reference scenario (without mitigation)(this is referring to the text in brackets)?	Accepted. Text revised	Aglaia Obrekht	Environment and Climate Change Canada	Canada
2999	52	19	52	27	The statement that both economic efficiency and environmental improvement can be achieved if the economy is initially below its frontier rests on many assumptions and the absence of many factors that might have let the economy to be off-the-frontier in the first place. So one must be careful not put a lot of faith in win-win relationship solutions particularly in the context of developing countries where pre-existing distortions are many.	Accepted. Text revised. Note of caution introduced.	Mustafa Babiker	Aramco	Saudi Arabia
20905	53	1	53	3	It seems to be also worth summarizing in table (together or separately) modelling studies finding "negative" outcome of mitigation on GDP(including those mentioned from page 49 line 44 to page 50) for better understanding of different perspectives on the impact of mitigation on growth.	Noted. Text will be revised to clarify mechanism linking GDP growth to higher emissions. Will consider putting information in Table format.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
10255	53	1	54	4	The studies that show positive GDP impacts from mitigation - do they account for positive impacts of mitigation on health, and then impacts of improved health on GDP? In particular when the mitigation reduces significantly the use of coal (e.g. in China).	Accepted. Text revised to clarify what is included, and what is not included in the evaluations.	Aglaia Obrekht	Environment and Climate Change Canada	Canada
37237	54	14	54	16	Could anything be said here about the impact that uncertain / regularly changing climate policy can have on workers in the renewable energy sector out of work (e.g. Spain, Germany)	Taken into account. This is a very specialized comment, but sources of uncertainty on impacts of mitigation policies on employment will be better discussed.	Michiel Schaeffer	Climate Analytics	Netherlands
10257	54	5	55	11	Similar comment as above: did any study look at the impacts of mitigation through improved health on the labour markets?	Rejected. While there is literature on labor productivity impacts of climate change, this is dealt with in Ch2.	Aglaia Obrekht	Environment and Climate Change Canada	Canada
46931	55	12	55	46	Concerning Section 4.3.3.4 Mitigation and equity in the short- and mid-term , I would like to draw your attention to a relevant ongoing EMF. EMF36 focuses on the distributional impacts within participating countries and regions of the Paris Agreement, with a 2030 perspective. It includes numerical comparisons of 15-20 different models with respect to impacts of climate policies by income group. The resulting papers will be submitted before cut-off 1 September. For more info at this stage, please contact Prof. Dr. Sonja Peterson (sonja.peterson@ifw-kiel.de) or Prof. Dr. Christoph Böhringer (christoph.boehringer@uni-oldenburg.de).	Noted. Will assess proposed references.	Taran Fæhn	Research Institute	Norway
708	55	17	55	20	The paragraph accurately cites recent evidence that there can be important distributional effects by the various policy options. It could be helpful to cite the recent contributions showing that regulation may be significantly more regressive than an energy tax. Levinson (Journal of the Association of Environmental and Resource Economists, Vol. 6, 2019) shows this both in theory and in application to vehicle fuel consumption in the United States.	Noted. Will assess proposed references.	Lutz Sager	Georgetown University	United States of America
16099	55	17	55	20	Please note that there may be some overlap with Sec 13.6, in which we look at the distributional effects of policies. We do not look at economy wide models but rather at specific instruments and their effects. It is worth coordinating on this point.	Accepted. Text will be revised after discussion with Ch13	Navroz Dubash	Centre for Policy Research	India
30239	55	21	55	27	For the non expert reader it is not immediately clear what "progressive" and "regressive" mean here; explain or use other wording	Accepted. Jargon to be eliminated	Bert Metz	European Climate Foundation	Netherlands
3001	55	28	55	36	Need also to cite literature on problems related to targeting and direct cash transfers in developing countries due to weak institutions, poor statistical records, and weak administrative systems.	Taken into account. Will look at literature on cash transfer programs	Mustafa Babiker	Aramco	Saudi Arabia
7037	55	37	55	46	It may be useful to consider there is practical, successful applications of carbon revenue rebating. British Columbia Canada introduced a household rebate that declines with income when it introduced its carbon tax in 2007, and also included rebates for northern residents who drive and heat more. As of January 2019, all Canadian regions that did not have their own carbon pricing systems have a federal system applied that rebates 90% of carbon pricing revenues back to households.	Noted. Will look at literature on this program	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNIVERSITY	Canada
36251	55	31			why not in developed countries?	Accepted. Examples from developed countries to be included.	Youba Sokona	South Centre	Switzerland
12689	56	1	56	7	Add direction of other WGs of AR6. Establish a cross-link with Chapter 6 (SLCFs) of WG1.	Accepted. Text revised	Yugo Kanaya	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	Japan
20907	56	1	56	7	Section 4.3.3.5 is too short compared to other sections 4.3.3.2-4.3.3.4. Currently, this section does not make any addition to previous IPCC reports.. More recent literature after 2018 could be also added, making this section on a par with other subsections of 4.3.3.	Accepted. Text revised.	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
16101	56	17	56	21	In practice "development measures" are more likely to be sectoral measures, so development in the context of urbanisation, employment, energy security etc. often mapping to ministries. Sometimes these may be bundled into a larger development plan but often not. So there is a meso layer here, more analogous to mitigation, which is sectoral transformation to achieve certain developmental objectives. I am suggesting the neat divide between mitigation and development measures may need to be muddled a bit. This could be reflected in Fig 4.7 by sub-dividing the "broader range of policies" into a few illustrative categories of urbanisation, transport etc. within the larger box.	Taken into account. Will introduce continuity between "accelerating mitigation" and "shifting development pathway"	Navroz Dubash	Centre for Policy Research	India
885	56	29	56	32	Are pledged mitigation efforts legally binding? If not, there is additional uncertainty with regard to achieving mitigation goals of the Paris Agreement.	Noted. This uncertainty is discussed in 4.2.2.6	Michael Kennish	Rutgers University	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
3003	56	8	59	16	Accretion of mitigation and shifting of development pathways have important link to specific country context, i.e. national circumstances, capabilities, and national development priorities. The country context seems to be largely absent in the discussion and analysis of the section.	Taken into account. This section introduces the concepts and thus remains general. Country specificities are discussed more in sections 4.4.1 and 4.4.2. More examples to be added.	Mustafa Babiker	Aramco	Saudi Arabia
35631	56	1			This text is important and should be integrated with the text above, and not something that is added afterwards.	Rejected. We feel having a specific section highlights importance of topic.	Göran Finnveden	KTH Royal Institute of Technology	Sweden
45147	57	1	57	4	Figure 4.7 on "mitigation measures and broader development measures" is a useful framing figure that can have extended discussions, also taking into account sustainable urban systems.	Noted. We are revising Fig.4.7 to take into account multiple (and conflicting) reviewer comments	Siir Kilkis	The Scientific and Technological Research Council of Turkey	Turkey
37239	57	2	57	4	This figure is not clear or helpful, and misses a lot. There should be a connection between mitigation and adaptation (greater mitigation facilitates adaptation)... demand-side measures are not only about behaviour, but also changing technologies and policies in end-use sectors. Many of the boxes are floating and it is unclear what point much of this diagram is supposed to make.	Noted. We are revising Fig.4.7 to take into account multiple (and conflicting) reviewer comments	Michiel Schaeffer	Climate Analytics	Netherlands
46421	57	3	57	3	I find fig. 4.7 rather confusing.	Noted. We are revising Fig.4.7 to take into account multiple (and conflicting) reviewer comments	Henrik Carlsen	Stockholm Environment Institute	Sweden
16231	57	3	57	4	In Figure 4.7, consider including military emissions (and policies related to military emissions) in the schematic, for clarity and accuracy.	Rejected. Figure 4.7 describes broad concepts. It does not intend to describe detailed sectoral issues.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
16103	57	4	57	4	I wonder whether this Figure does not fully support the point you are trying to make. In fact, many of the demand and supply side policies that you have put on the left may be driven by development type objectives - access, energy security, urban congestion. The diagram forces the reader to chose a primary motivation - mitigation or development, while in practice there are multiple objectives to be gained, and sometimes the same policy is justified using different goals to different audiences. Is that multiple objectives frame not more elastic as well as more reflective of reality? I understand the motivation of the diagram, to make clear that many mitigation actions are actually development actions, but, in fact, one can go further and argue that "pure" climate or even climate first actions are very limited, to C tax and cap and trade type policies. In many jurisdictions, the multiple and overlapping objecties will more accurately reflect reality. Also, where is finance on this diagram?	Noted. We are revising Fig.4.7 to take into account multiple (and conflicting) reviewer comments	Navroz Dubash	Centre for Policy Research	India
37757	57	4	57	4	Figure 4.7 does not achieve what is explained in line 37, page 56. not clear to understand. could be simplified	Noted. We are revising Fig.4.7 to take into account multiple (and conflicting) reviewer comments	Michiel Schaeffer	Climate Analytics	Netherlands
30241	57	15	57	22	What is missing here is addressing inequality. Inequality was suggested in previous sections to be an obstacle for effective climate policies (a justification of this relationship was missing though). Make sure the mechanism of inequality influencing development and climate policy is made clear. One possible mechanism is that inequality has a negative impact on public support/ acceptance of mitigation policies.	Noted. We are revising Fig.4.7 to take into account multiple (and conflicting) reviewer comments	Bert Metz	European Climate Foundation	Netherlands
17405	57				The figure 4.7 is confusing and needs to be corrected.	Noted. We are revising Fig.4.7 to take into account multiple (and conflicting) reviewer comments	Zeyaezan Sadegh	Islamic Republic of Iran Meteorological Organization (IRIMO)	Iran
7039	58	1	58	1	Perhaps add "Mandated climate risk exposure assessment as part of general risk exposure" to Finance and Investment	Noted. While relevant, climate risk exposure are more adaptation than mitigation.	CHRISTOPHER BATAILLE	IDDR.ORG/SIMON FRASER UNVIERSITY	Canada
46423	58	1	58	1	Why decision-making as one measure? DM is related to all measures.	Accepted. Table revised.	Henrik Carlsen	Stockholm Environment Institute	Sweden
16233	58	1	58	2	In Figure 4.8, consider adding a bullet to the Decision-Making category related to military choices in GHG emissions, for increased emphasis on the military as a driver of climate change.	Rejected. While military contributions to GHG may be significant, not typically considered as a measure of development pathways	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
37267	58	2	58	2	label "decision making" what it is, as in text "Processes and institutions of decision-making". Doesn't make sense in figure	Accepted. Table revised.	Michiel Schaeffer	Climate Analytics	Netherlands
16105	58	3	58	6	I agree with this statement, but wonder whether it is consistent with Fig 4.7	Noted. We are revising Fig.4.7 to take into account multiple (and conflicting) reviewer comments	Navroz Dubash	Centre for Policy Research	India
16107	58	8	58	8	This is a very useful check list which we will consider in CH 13 - list of various policies across categories.	Noted	Navroz Dubash	Centre for Policy Research	India
16109	58	15	58	15	May wish to cross reference CH 13, sec 13.2	Accepted. Text revised	Navroz Dubash	Centre for Policy Research	India
6155	58	1	59	15	One common problem I find in this chapter is the abundance of conjectures, not supported by the literature. The discussion about Figure 4.8 is a very good example. I understand the AR as a summary of the scientific evidence, not as a place to state ideas without clear attribution.	Accepted. Statements must be supported, and will check. Do note that para's before Fig 4.8 do refer to literature, and below it we refer to ch 5 and its literature assessment. Nevertheless, point taken that we must check.	Linares Pedro	Universidad Pontificia Comillas	Spain
2609	59	4	59	11	Incentivising (subsidising) alternative technologies that consume less energy than traditional versions (e.g. LEDs vs. filament bulbs for lighting) to reduce or eliminate the purchase price difference would encourage their speedier uptake. There are several global initiatives to restrict the sales of filament bulbs (typically by wattage) in different countries. This is mentioned in Chapter 5 of this report. https://thinkprogress.org/5-charts-that-illustrate-the-remarkable-led-lighting-revolution-83ecb6c1f472/ . On a personal note, all the lighting in my home is LED and the company I work for has also converted over to LED lighting.	Rejected. Out of scope of Ch4. This likely belongs to Ch6 (energy systems) or Ch13 (policy instruments)	Michael Czerniak	Atlas Copco - Edwards	United Kingdom (of Great Britain and Northern Ireland)
16111	59	17	59	17	As an approach, I wonder whether opening up the section with the mutiple objectives framing rather than ending it with this framing may be more productive?	Noted. Will consider it.	Navroz Dubash	Centre for Policy Research	India
46425	59	17	59	32	Cf. Comment no. 29	Rejected. Unclear what comment #29 is.	Henrik Carlsen	Stockholm Environment Institute	Sweden
16113	59	23	59	23	Pls also consider citing another article directly on this theme: https://www.sciencedirect.com/science/article/pii/S221462961830611X#bib0285	Noted. Will review proposed reference	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
30243	59	33	73	9	It is unhelpful for the (policy maker) readers that the "How to shift" question is not put more central to this chapter. If that would be done then the long introductory sections could be focused immediately on the "how to" question, as in fact many sections are discussing such issues. This could also considerably shorten the whole chapter and make it more policy relevant.	Taken into account. We agree that insights that can help policymakers is central. However, Ch4 has been given other objectives as well (e.g. gap analysis in 4.2). In addition, readers must be walked through the concepts (incl. Shifting development pathways). Will highlight point on "how to" in exec summary and intro.	Bert Metz	European Climate Foundation	Netherlands
27773	59	33	77	22	Many of the individual points mentioned here from a mostly empirical (or plausibility) viewpoint might be advantageously reframed in terms of external effects. socially optimal vs privately optimal behaviour, coordination and incitation problems, thus providing clear guidelines and links to the theoretical literature. A good example is p. 76 l. 22 "however, there are risks that actors may wish to focus on adaptation for themselves"	Taken into account. Will make sure to use conceptually clear terminology. On the other hand, systematically framing the section in economic terms does not necessarily makes the points clearer to the readers.	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
16115	60	1	60	4	This is very useful, as it gives concrete examples of approaches to shifting development pathways. Perhaps it might be useful to highlight, as a necessary conditions, that this sort of deliberate and strategic shifting of pathways requires the presence of strong state institutions, which is the topic of 13.2. Another point of linkage is 13.6, which looks at policy mixes to bring about these sorts of pathway changes. It is worth coordinating our discussions in these sections and cross referencing.	Accepted. Text revised.	Navroz Dubash	Centre for Policy Research	India
6157	60	5	60	7	Another instance of my previous comment. Where is the evidence for high agreement about this statement?	Taken into account. The specific statement p.60 lines 5-7 is supported by box with many references. Point taken, however.	Linares Pedro	Universidad Pontificia Comillas	Spain
16117	60	5	60	7	As a general point, there are several points in the chapter where you have uncertainty language for an overarching sentence such as this, but with no citations at that spot. I understand that perhaps you use this as an overarching sentence for material that is about to be presented in some detail, along with citations. However, as a reader, it is hard for me to judge the citation basis for a 'limited evidence' sort of statement because the statement and the citations are separated in space. This is just a general comment about use of uncertainty language, something we are also trying to figure out in CH 13 and we would be happy to compare notes.	Accepted. Our sense is that the confidence statement comes after a chapter has assessed literature, with citations right above (or below). Repeating them in the sentence would be duplicative.	Navroz Dubash	Centre for Policy Research	India
4985	60	12	60	48	The deforestation of the Amazon is opposed to these written norms	Rejected. Not clear what the reviewer would like to see changed in Box 4.4. The box already discusses evolution of deforestation dynamics in the Amazon.	MARIA DEL VALLE MORRESI	UNIVERSITY	Argentina
34807	60	9	72		Box 4.1 "India's national development plan and mitigation", should be inserted properly. It is subdivided into two pages. In addition, table 4.8 should be inserted in the appropriate page	Editorial – copyedit to be completed prior to publication	Onema Adojoh	Missouri University of Science and Technology, Rolla, USA	United States of America
20909	60	2			Edit a minor error in the sentence: (4.4.1.1) 4.4.1.4)	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
20911	60	10			Edit a minor grammatical error in the sentence: "in achieve a mitigative capacity"	Editorial – copyedit to be completed prior to publication	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
46427	61	24	61	30	Strange para.	Accepted. Text revised.	Henrik Carlsen	Stockholm Environment Institute	Sweden
30245	61	26	61	30	It is not clear what the difference is between past structural transformation policies and the ones needed to promote sustainable development. Needs to be elaborated. What is "steering investment behaviour in a socially agreed direction"? why is "encompassing policy coordination" qualified as a structural change policy?	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
887	61	27	61	30	The structural transformation policies being called for will require considerable time for countries to approve, develop, and implement. The timeline for implementing many of these structural transformation policies will exceed the timeline of drastic cuts in GHG emissions needed to meet the climate objectives in the Paris Agreement for the near- and mid-term.	Accepted. Text revised. Will signal the difficulty of rapidly transforming structure. Some structural transformation will take time (though others can be very fast after the tipping point is passed), making it all the more important to put enabling conditions in place early.	Michael Kennish	Rutgers University	United States of America
889	61	39	61	41	Governments in many countries may not be so quick to embrace carbon taxation and emissions permit auctioning. The fiscal reforms outlined in Section 4.4.1.2 do not deal with political pushback that is already taking place in some countries. While the information described in Section 4.4.1.2 is certainly vital to achieving the climate goals noted in the Paris Agreement, it is necessary to also deal with the other side of the ledger driven by the private sector, which will likely be pushing for government decisions in another direction. It would be prudent to expand Section 4.4.1.2 and discuss all of the issues that will influence fiscal reforms, including those just mentioned.	Taken into account. Political economy of fiscal reforms with a carbon component is already present in the text. Will expand and point to relevant sections in other chapters.	Michael Kennish	Rutgers University	United States of America
30247	61	41	61	47	The Swedish example is interesting as it shows what environmental taxation can do to broaden the tax base. However, the use of the additional revenue for lowering the marginal tax rates is not the best way to drive society toward a sustainable situation, as it increases inequality. It would be good to make that point.	Rejected. The literature is clear that the "best" revenue recycling options depend (a) on policy objectives; and (b) on the pre-existing fiscal system. Given the wide differences in (b) across countries, it is not possible to draw general lessons.	Bert Metz	European Climate Foundation	Netherlands
2629	61	31	62	33	This subsection on fiscal reforms does mention the most important considerations, specifically on page 62 lines 11-13 (the resources created by mitigation taxes should be earmarked toward mitigation) and page 62 lines 26-27 (these resources will disappear as mitigation becomes successful). However these statements lack strength and moreover are drowned in a mass of other remarks. The analysis is weakened, in my opinion, as soon as mitigation becomes considered as a secondary objective while the priority concern consists in reaching the SDG. This tends to be the case here as in other parts of this FOD.	Rejected. While the fact that environmental taxation erodes its own fiscal base is correct, the recommendation that proceeds from the tax be recycled into mitigation is not supported by the literature (depending on the pre-existing fiscal system, other recycling schemes may have better macroeconomic and environmental performances). In addition, the whole point of section is to highlight the importance of not considering mitigation alone, but rather as part of broader policy packages.	Philippe Waldteufel	CNRS/IPSL/LATMOS	France

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
891	62	9	62	19	There already is pushback against carbon taxation in the U.S. and other countries by various entities, even considering potentially favorable future revenue shifting. The timeline for taxation change of this magnitude will be slow and not conducive to achieving short- and mid-term climate goals. Again, there needs to be more extensive and objective assessment of all aspects of carbon taxation and emissions permit auctioning as it relates to the current timeline required for GHG emissions reduction in the near- and mid-term.	Taken into account. Political economy of fiscal reforms with a carbon component is already present in the text. Will expand and point to relevant sections in other chapters.	Michael Kennish	Rutgers University	United States of America
4129	62	9	62	19	Some very recent literature on social acceptability of carbon taxes and political vagaries can be found in: Walker, C. (2020). Bill 4 and the removal of Cap and Trade: A case study of carbon pricing, climate change law and public participation in Ontario, Canada. <i>Journal of Environmental Law and Practice</i> , 33(1) (March 2020). and Maestre-Andrés, S., Drews, S., & van den Bergh, J. (2019). Perceived fairness and public acceptability of carbon pricing: a review of the literature. <i>Climate Policy</i> , 19(9), 1186-1204.	Noted. Will assess proposed reference	Chad Walker	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
30249	62	10	62	10	"mitigation policies" should probably be "fiscal policies" or "carbon taxes"	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
30251	62	10	62	33	It would be good to more systematically discuss how carbon taxes could be structured to become acceptable and effective, leading to a list of "do's and dont's" that policy makers can use.	Taken into account. The point made here is that carbon taxes have a much higher chance of becoming politically acceptable if inserted within a broader fiscal reform. Other aspects of fiscal reform setting are more relevant to Ch13.	Bert Metz	European Climate Foundation	Netherlands
10265	62	20	62	22	Fiscal reforms maybe easier to pass in the times of low energy prices for countries that are not big energy producers. For energy producing countries, such as Canada, it may be harder, since the oil producers are already suffering from low prices. So there is no win-win for Canada - when the energy prices are high - addition of a carbon tax would not be taken well by households, when the energy prices are low - you would get a bad reaction from producers, and therefore those employed in the energy sector (Alberta, Saskatchewan).	Accepted. Text revised.	Aglaia Obreht	Environment and Climate Change Canada	Canada
30253	62	35	63	11	It would be helpful to make a distinction between developing and developed economies in analysing what would be appropriate policies on spacial and transportation planning, as there are strong differences. This discussion would benefit from some quantitative information on the impact of such policies on emissions.	Accepted. Will look at literature to provide more examples.	Bert Metz	European Climate Foundation	Netherlands
24981	63	24	63	41	Refer to reliable and affordable energy access as well, as these relate to poverty issues	Accepted. Text revised.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
30255	63	25	63	31	This is the first time in the chapter the relationship between inequality and emissions is discussed. Surprisingly the message seems to be that the impact of inequality on emissions is unclear and at best weak, while earlier in the chapter the message was that reducing inequality is an important feature of making development more sustainable and low carbon. The reference in this paragraph to inequality "amongst the poor" and "inequality amongst the rich" is unclear. I would expect that inequality is about the difference between poor and rich. Impact of inequality on public support for mitigation policies and social policies deserves discussion I think.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
30257	63	33	63	34	Much progress has been made on providing access to modern energy over the past 5 years. This sentence is therefore not longer valid. Give some data on current energy access.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
7041	63	34	63	34	You need to add a few words to clarify that you are referring to a large scale DECREASE in the cost of PV generation	Accepted. Text revised.	CHRISTOPHER BATAILLE	IDDRI.ORG/SIMON FRASER UNVIERSITY	Canada
10259	63	34	63	34	larg scale 'decrease' in photovoltaic electricity? Maybe increase?	Accepted. Text revised.	Aglaia Obreht	Environment and Climate Change Canada	Canada
893	63	43	63	47	Section 4.4.2 may be the most important section in Chapter 4 because it provides an accurate and objective assessment of one of the most important pressing problems that now exists in climate change mitigation over the near- and mid-term. In addition, there are astute recommendations offered to improve conditions. Consideration should be given to expanding this section with more detail because of its significant conclusions.	Noted. Thank you	Michael Kennish	Rutgers University	United States of America
16235	63	42			In Section 4.4.2 Enabling conditions that lead to transformational change, consider adding an analysis of global military policies in relation to their GHG emissions, as well as of how reducing the risk of war regionally and globally can facilitate a just transition to a low-carbon global economy, for the sake of clarity and accuracy.	Noted. Will look for relevant literature.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
6173	64	1	64	4	The challenge of overcoming the bottom-up nature of most participatory processes still exist, and should be given due consideration. Secondly, dealing with high transaction costs arising from participatory and inclusive governance is imperative. See: Acciaioli, G. (2009). Conservation and community in the Lore Lindu National Park: Customary custodianship, multi-ethnic participation, and resource entitlement. In C. Warren, & J. McCarthy (Eds.), <i>Community, environment and local governance in Indonesia: Locating the commonwealth</i> (pp. 88–118). Oxon, UK: Routledge. Mustalahti, I. (2006). How to handle the stick: Positive processes and crucial barriers of participatory forest management. <i>Forests, Trees and Livelihoods</i> , 16(2), 151–165. DOI: https://doi.org/10.1080/14728028.2006.9752553	Noted. Will review proposed references.	Jude Ndzifon Kimengi	Department of Geography and Environmental Studies, Catholic University of Cameroon (CATUC)	Cameroon

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30259	65	9	65	13	This paragraph needs further elaboration on what the relevant institutional capacities and mechanisms are and how they can be strengthened	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
895	65	19	65	21	Successful mitigation pathways consistent with the 1.5°C and 2°C temperature scenarios will require steep transformational changes. A major uncertainty is whether enough people will be receptive to the behavioural and lifestyle changes necessary to advance these transformational changes. The importance of behavioural and lifestyle changes in people cannot be overestimated for meeting international targets in climate change. It has not been adequately assessed in the literature. Section 4.4.2.2 should be expanded because the subject of behaviour and lifestyles does not receive sufficient coverage relative to other sections in the chapter.	Rejected. Ch4 outlines the main enabling conditions for shifting development pathways and accelerating mitigation. Full discussion of behavior change is in Ch5	Michael Kennish	Rutgers University	United States of America
30503	65	22	65	22	Is it possible to have a chart here, outlining the highest emitting behaviours, to give policy makers a better understanding of what drivers could be included in policy? A chart could be enlightening, and give needed research findings to empower policy makers on effective and fair policy choices.	Noted. Additional chart to be considered.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
30505	65	34	65	37	Yes, they are often outside the market system, and as the market system is limited in its effectiveness for the urgency required, a chart outlining research on high-emitting behaviour practices would be important information for policy decision making.	Noted. Additional chart to be considered.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
30261	65	18	66	10	What is missing in the section is the connection between behavioural change and development paths. The discussion is mostly focused on climate mitigation alone. It would be helpful to identify other benefits. The section discusses several strategies to promote behavioural change, but does not go into depth on lessons to be learned from behavioural science (UNEP 2017 b). A list of the most promising approaches that policy makers can work with would be very helpful	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
30507	66	8	66	10	Exactly, which is why a simple chart would be helpful. In the SRCLL, for example, there was a chart on various diets and their mitigation potential. This could also be done for travel, clothing consumption, other high-emitting material consumption, etc. This could also help civil society readers to better inform their communities on how to make a meaningful individual contribution toward a healthier world for their children and future generations. Please!	Noted. Additional chart to be considered.	Lindsey Cook	Quaker United Nations Office / Friends World Committee for Consultation (IPCC Observer)	Germany
729	66	11	66	44	this sub-section seems an outlier in Ch. 4, not sure how financial systems fits here. Rather, this could be a reference to Ch. 15 where some of these messages have been further refined and elaborated on.	Taken into account. Will keep discussion on finance as one of six enabling conditions as outlined in Fig 4.9, but point more to Ch15 for details	Christa Clapp	CICERO	Norway
13371	66	11	66	44	Numerous financial issues are highlighted in this section. It does however seem that a crucial issue is missing, which is not addressed at other stages in the chapter, namely finance for new fossil fuel expansion. Banktrack (2019) Banking on climate change, for example, has shown that the biggest banks in the world have invested 1.9 trillion US dollars into fossil fuel projects since the Paris Agreement. This is clearly a major elephant in the room and should be addressed.	Taken into account. Will include this point into discussion, together with others	Adam Pawloff	Greenpeace	Austria
30263	66	11	66	44	this section should be restructured in order to present the most promising policy interventions to transform the financial system towards delivering climate goals and SDGs. The current structure of the section just describes the various pieces of literature, but a real assessment looks across these literature sources to come up with a workable list of policy interventions.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
24983	66	17	66	19	Delete "International climate finance ... sustainable development objectives."	Rejected. No rationale provided for deletion	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
897	66	22	66	31	Financing necessary to achieve steep GHG emissions reduction to meet near- and mid-term goals is not adequate. The political climate may not be conducive as well. Nationalism, which is gaining favor in a number of developed countries, focuses on resolving problems of national interest rather than those of global expanse. The shifting interest of developed nations can significantly affect policy efforts to direct financial resources to developing nations for dealing with climate change problems. Government reduction in climate finance due to shifting political platforms means that global public and private investment will take on an increasingly important financial source to deal with climate change. Section 4.4.2.3 does not address the vagaries of national politics that will affect financing of climate mitigation and other programs in the near- and mid-term. This is an important subject that also needs to be addressed in this section of the chapter.	Taken into account. Will insert and point to relevant sections in Ch13	Michael Kennish	Rutgers University	United States of America
15521	66	34	66	35	The idea of de-risking low-emissions investment is important, but so too could be increasing the risk for high-emissions development. I suggest that this idea be added, meaning, it isn't only that we must move towards low-emissions technology, but we also need to move rapidly away from high-emissions technology. For general insights see e.g. York, R. & Bell, S. E. Energy transitions or additions? Energy Research & Social Science 51, 40–43 (2019). For idea on analyzing increase risk environment for fossil fuels, see e.g. ERickson et al, Why fossil fuel producer subsidies matter. Nature 578, E1–E4 (202	Accepted. Text revised. Will assess proposed references.	Peter Erickson	Stockholm Environment Institute	United States of America
30265	67	1	67	30	this section should be restructured in order to present the most promising policy interventions to stimulate innovation towards delivering climate goals and SDGs. The current structure of the section just describes the various pieces of literature, but a real assessment looks across these literature sources to come up with a workable list of policy interventions.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
7043	67	9	67	17	In sectors with long lived capital stock (heavy industry, buildings, infrastructure) directed innovation and accelerated commercialization will be absolutely necessary to make sure the next generation of investment is very low or zero emissions (Bataille 2020) . Source: Bataille, C. 2020. Physical and policy pathways to net-zero emissions industry. WIREs Climate Change. 2020;11:e633. https://doi.org/10.1002/wcc.633	Accepted. Text revised.	CHRISTOPHER BATAILLE	IDDR1.ORG/SIMON FRASER UNVIERSITY	Canada
6175	67	19	67	19	...transitions does not...	Accepted. Text revised.	Jude Ndzifon Kimengi	Department of Geography and Environmental Studies, Catholic University of Cameroon (CATUC)	Cameroon
11425	67	31	68	23	Section 4.4.2.5 Policy: See comment on Section 4.3.3.2. Policy approaches ("prosperity proposals") of "degrowth" or "a-growth", i.e. economic policies that are not focused on economic growth but on a managed reduction of environmental impacts should be discussed here (or in other sub-sections of Chapter 4). Key references include: van den Bergh, J. C. J. M. (2017) A third option for climate policy within potential limits to growth. Nature Climate Change, 7(2), 107-112. https://www.nature.com/articles/nclimate3113 Cosme, I., Santos, R. and O'Neill, D. W. (2017) Assessing the degrowth discourse: A review and analysis of academic degrowth policy proposals. Journal of Cleaner Production, 149, 321-334. http://dx.doi.org/10.1016/j.jclepro.2017.02.016 Costanza, R., Kubiszewski, I., Giovannini, E., Lovins, H., McGlade, J., Pickett, K. E., Ragnarsdóttir, K. V., Roberts, D., Vogli, R. D. and Wilkinson, R. (2014) Time to leave GDP behind. Nature, 505, 283-285. http://www.nature.com/news/development-time-to-leave-gdp-behind-1.14499?WT.ec_id=NATURE-20140116 Jackson, T. (2017) Prosperity without Growth - Foundations for the Economy of Tomorrow. 2nd Edition. Earthscan, London, UK. https://timjackson.org.uk/ecological-economics/pwg ; https://www.routledge.com/Prosperity-without-Growth-Foundations-for-the-Economy-of-Tomorrow-2nd/Jackson/p/book/9781138935419 Weiss, M. and Cattaneo, C. (2017) Degrowth – Taking Stock and Reviewing an Emerging Academic Paradigm. Ecological Economics, 137, 220-230. http://www.sciencedirect.com/science/article/pii/S0921800916305900 Victor, P. A. (2019) Managing without Growth - Slower by Design, not Disaster. Second Edition. Advances in Ecological Economics. Edward Elgar, Cheltenham, UK, Northampton MA, USA. https://doi.org/10.4337/9781785367380 , https://www.e-elgar.com/shop/managing-without-growth-second-edition Büchs, M. and Koch, M. (2018) Challenges for the degrowth transition: The debate about wellbeing. Futures, 105, 155-165. https://linkinghub.elsevier.com/retrieve/pii/S0016328718300715 Alexander, S. and Yacoumis, P. (2018) Degrowth, energy descent, and 'low-tech' living: Potential pathways for increased resilience in times of crisis. Journal of Cleaner Production, 197, 1840-1848. http://www.sciencedirect.com/science/article/pii/S095965261631441X https://www.sciencedirect.com/science/article/pii/S095965261631441X Perkins, P. E. (2019) Climate justice, commons, and degrowth. Ecological Economics, 160, 183-190. http://www.sciencedirect.com/science/article/pii/S0921800918303021 D'Alisa, G. and Kallis, G. (2020) Degrowth and the State. Ecological Economics, 169, 106486. http://www.sciencedirect.com/science/article/pii/S092180091831749X	Taken into account. Will include discussion on de-/a growth when introducing development pathways in 4.3.1.	Thomas Wiedmann	UNSW	Australia
30267	67	31	68	23	This section is very general and therefore not very effective in giving messages to policy makers they can work with. The general notion of using a multi-dimensional policy approach is good, but it should be illustrated with a few cases relevant to changing development pathways. What this section also should do is identifying what types of policies work under what kind of circumstances/ political environments and what policies do not work. The policie categories mentioned in the current text all look prety climate centric. That is not what this section is about.es that apply to the topic of changing	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
16119	68	8	68	9	This resonates with 13.6 - policy mixes	Accepted. Text revised	Navroz Dubash	Centre for Policy Research	India
899	68	8	68	12	It is clear that increased public and private investment will be necessary to achieve the near- and mid-term goals of global emissions reduction. As noted on page 66, "...global public and private investment in climate mitigation and adaptation is approximately USD455 billion per year, this is inadequate to the estimated USD2.4 trillion per year that is needed to transform systems to address climate change (Yeo 2019)." Insufficient financing of climate change mitigation is a major impediment to achieving GHG emissions reduction goals. New investment strategies must be pursued to increase financing of climate change in the near- and mid-term.	Noted. In support of 4.4.2.3. Global investment figures are discussed in Ch15	Michael Kennish	Rutgers University	United States of America
15523	68	8	68	12	The classic typology of policies described here is accurate, but such policies need not only focus on supporting low-carbon technology, but also on limiting or destabilising high-carbon technology. See e.g. Green, F. & Dennis, R. Cutting with both arms of the scissors: the economic and political case for restrictive supply-side climate policies. Climatic Change 150, 73–87 (2018). & Lazarus, M. & van Asselt, H. Fossil fuel supply and climate policy: exploring the road less taken. Climatic Change 150, 1–13 (2018).	Noted. Will review proposed reference	Peter Erickson	Stockholm Environment Institute	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30867	68	20	68	22	Consider change to High Confidence In a broad and long standing literature in consumer research the useful of this Rational actor view has long since been replaced with consumer as emotional (Luce et al, 2001) and experiential decision maker (Holbrook and Hirschman, 1982). These views are based on the underlying physiological processes associate with systems 1 and 2 information processes (Damasio, 2006, Lerner et al, 2015). Damasio, A.R., 2006. Descartes' error. Random House. Holbrook, M.B. and Hirschman, E.C., 1982. The experiential aspects of consumption: Consumer fantasies, feelings, and fun. Journal of consumer research, 9(2), pp.132-140. Lerner, J.S., Li, Y., Valdesolo, P. and Kassam, K.S., 2015. Emotion and decision making. Annual review of psychology, 66, pp.799-823. Luce, M.F., Bettman, J.R. and Payne, J.W., 2001. Emotional decisions: Tradeoff difficulty and coping in consumer choice. Monographs of the journal of consumer research, (1), pp.1-209.	Noted. Will review proposed reference. There is no confidence statement p.68 lines 20-22, on the other hand.	Professor Black	University of Stirling	United Kingdom (of Great Britain and Northern Ireland)
901	68	27	68	36	It would be most useful to conduct an accurate quantitative analysis of the literature to reduce the uncertainties of the global level of emissions projected for 2030 and 2050. This is particularly important because of the uncertainties involving accelerating mitigation and development pathways and variable financing that will unfold during the near- and mid-term.	Taken into account. Will provide information country-level uncertainty, literature permitting.	Michael Kennish	Rutgers University	United States of America
30283	68	41	68	42	add case examples	Accepted. Examples to be added.	Bert Metz	European Climate Foundation	Netherlands
30281	68	45	69	2	already mentioned in line 29 on page 68	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
16237	68	24			In Section 4.4.3 Taking uncertainties and risks into account, consider adding a description of the risk of nuclear arms proliferation in response to new countries acquiring nuclear power. For a treatment of this topic, see, for example, Goldemberg, J., 2009. Nuclear energy in developing countries. Daedalus, 138(4): 71-80. Notably missing from plans for adopting nuclear power in a widespread fashion to address climate change is a new international mechanism that would identify the most nuclear-arms-proliferation-resistant pathway and require that this pathway be followed. The current Non-Proliferation Treaty was not adopted to address climate change, and its utility is not up to the task. For example, Saudi Arabia is presently developing facilities for nuclear materials enrichment to fuel its planned new nuclear power program, and this may be a pretext for nuclear arms production.	Rejected. Outside of the scope of this chapter. However, "black swan" events to be mentioned in this section.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
30279	69	7	69	7	"the risk of inequitable or non-representative power dynamics" what is that. Explain.	Accepted. Text revised	Bert Metz	European Climate Foundation	Netherlands
24985	69	12	69	39	Correct what relates to irreversibility and what to inertia	Accepted. Text revised.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
30277	69	19	69	21	Unclear. Cannot refer to 1.5C, as previous sentence says that reductions after 2030 will not longer allow to keep this target. So to what "end of century" target does this apply?	Accepted. Text revised	Bert Metz	European Climate Foundation	Netherlands
44593	69	19	69	21	Carbon Dioxide Removal would already be needed to reach net zero emissions (by offsetting residual emissions), technological options starting in the 2030s and (together with negative LULUCF) reaching significant numbers by 2050 already. Probably better to say "net negative emissions" here	Accepted. Text revised.	Oliver Geden	German Institute for International and Security Affairs	Germany
30275	69	27	69	27	" 1.5 or 2C" which one? Cannot be both	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands
44183	69	29	69	29	See also Gambhir et al (2017) Assessing the Feasibility of Global Long-Term Mitigation Scenarios, Energies, 10(1), 89, https://doi.org/10.3390/en10010089 which systematically compares coalplant stranding across scenarios with different long-term temperature targets.	Noted. Will review proposed reference	Ajay Gambhir	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
30273	69	35	69	39	I expect here some relevant conclusions on what constitutes effective hedging strategies when pursuing SDGs and climate goals. That is now absent and makes it very hard for policy makers to draw lessons	Taken into account. Section to be revised with more information on hedging strategies.	Bert Metz	European Climate Foundation	Netherlands
30271	69	41	69	42	Why is that the case? Explain	Noted. Will try and come up with explanation.	Bert Metz	European Climate Foundation	Netherlands
16775	69	40	70	17	The issue of equity is cross-referenced between 4.2.2.5 and 4.4.4 and not treated extensively in either of these. The topic is of such importance for the achievement of the Paris Agreement that it deserves much more scrutiny.	Accepted. Boundaries between 4.2.5 and 4.4.4 (now 4.5 in FOD) clarified	Dennis van Berkel	Urgenda	Netherlands
16777	69	40	70	17	The chapter should give special attention to the consequences of mitigation levels of individual or groups of countries on the achievement of the Paris Agreement Temperature target. This was discussed in the context of AR5. Since then more literature has been published on the influence of free-rider behaviour on cooperation in the context of the the Paris Agreement. See for instance Scott Barrett, Coordination vs. voluntarism and enforcement in sustaining international environmental cooperation, Proceedings of the National Academy of Science, volume 113, 2016, p. 14515, at p. 14516.	Rejected. Section 4.4.4. will touch on equitable effort sharing across nations, but issues associated with international cooperation are dealt with in Ch14.	Dennis van Berkel	Urgenda	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
4127	69	40	73	9	There is a good discussion here on environmental and energy justice but the authors fail to mention, let alone explain, the importance of procedural justice as a very important element of equity/just transitions. At the top of page 70, the authors write about distributive justice (but could go further in calling it so, and here could be a good place to talk about procedural justice. Another good place for this piece on PJ would be from lines 10-17 on page 70, where the chapter talks about fairness of such arrangements. PJ has mostly been studied on the local level, and good recent citations in this area could be: Walker, C., & Baxter, J. (2017). Procedural justice in Canadian wind energy development: a comparison of community-based and technocratic siting processes. Energy research & social science, 29, 160-169. and Page, E. A. (2012). The hidden costs of carbon commodification: emissions trading, political legitimacy and procedural justice. Democratization, 19(5), 932-950. and Simcock, N. (2016). Procedural justice and the implementation of community wind energy projects: A case study from South Yorkshire, UK. Land Use Policy, 59, 467-477.	Noted. Will consider expanding on procedural justice. We will assess proposed references.	Chad Walker	University of Exeter	United Kingdom (of Great Britain and Northern Ireland)
16773	69	40	73	9	The chapter joints together the issue of just transition and equity. They are two very different concepts however and should be treated separately.	Rejected. Section 4.4.4. makes clear that just transition is a focal point for the (broader) discussion on equity. Comment does not provide rationale why the concepts should be separated further than they are in current text.	Dennis van Berkel	Urgenda	Netherlands
16239	69	40			In Section 4.4.4 Equity, including just transition, consider including a description of climate-driven war as a driver of outcomes that are unjust, for the sake of accuracy and clarity of the text.	Taken into account. Although the focus of WG3 is on mitigation, the revised section will mention unequal distribution of climate risks, and refer to WG2. Details (including risks of climate-related conflicts) should be discussed by WG2.	Daniel Helman	College of Micronesia-FSM	Micronesia, Federated States of
16449	70	5	70	8	For equity frameworks for emissions allocations, please also cite the papers published by scholars from the developing countries reflecting their equity perspectives. For instance, Pan et al (2014; Sharing emission space at an equitable basis: Allocation scheme based on the equal cumulative emission per capita principle; doi: http://dx.doi.org/10.1080/14693062.2013.777610 http://dx.doi.org/10.1016/j.apenergy.2013.07.021) propose an approach based on cumulative emissions per capita; Winkler et al (2013; Equitable access to sustainable development: operationalizing key criteria; http://dx.doi.org/10.1080/14693062.2013.777610) propose the South African approach based on responsibility-capability-need. If the authors want to use comprehensive assessments of different equity frameworks, then Pan et al. (2015; Countries' emission allowances towards the low-carbon world: A consistent study; http://dx.doi.org/10.1016/j.apenergy.2015.06.011) could be cited which analyzes more number of allocations than the citations here.	Noted. Will assess proposed reference.	Xunzhang Pan	School of Economics and Management, China University of Petroleum, Beijing 102249, China	China
46291	70	5	70	8	Lines 5 to 8 are erroneous. Many of the references cited here are not based, or only partly based, on a carbon budget. (Robiou du Pont and Meinshausen 2018), (Robiou du Pont, 2017) and (Pan et al, 2015) do not use carbon budgets. These studies directly distribute emissions rights of cost optimal IAM scenarios dynamically, instead of their integral over time (that is a budget). To my knowledge, parts of the other cited works (Climate Action Tracker, 2017, 2018) (CSO Equity Review 2018, 2015, 2017) (Holz et al. 2018) (Kemp-Benedict et al. 2018) are also not entirely based on budgets and distribute emissions dynamically, not only on the sole basis of historical responsibility. I suggest adding a reference to (Robiou du Pont, Nature Climate Change, 2017) which quantifies multiple effort-sharing allocations individually.	Noted. Will make clearer in SOD that this is a general approach of allocation, and the to some extent, earlier, referenced studies start from a fixed carbon budget over time, and they have an allocation rule to distribute it to each country. Will assess proposed reference.	Yann Robiou du Pont	IDDRI	France
13139	70	5	70	9	This section refers to "extensive literature on equity frameworks for national emissions allocations" but fails to discuss the substance of these frameworks. Also, Crosland et al. (2016) should be referenced here as a framework designed to enable courts to assess whether national emissions allocations are in line with the goals and equity requirements of the Paris Agreement. The limitations of the implicit normative choices made in quantified equity frameworks identified in Kharta et al. (2018a) should be identified and discussed. The section should also (here or elsewhere) discuss literature that discusses how courts are starting to grapple with equity in climate litigation, including Ferreira (2016) which discusses the potential of courts interpreting the principle of equity and common but differentiated responsibilities and respective capabilities to assess whether a state has complied with its obligations under the UNFCCC and Paris Agreement.	Taken into account. Revised chapter to include more assessment (as opposed to review). Will assess proposed reference.	Margaretha Wewerinke-Singh	Leiden University; University of the South Pacific	Netherlands
18543	70	5	70	9	It would be useful, if here the content of the cited literature is summarised, in particular the resulting quantitative ranges of allocation studies per country/region. Currently the text only states that there is literature.	Accepted. Text revised.	Niklas Höhne	NewClimate Institute	Germany
5051	70	10	70	17	This chapter dealt with "just transition" especially equity issues and transition. Poverty is discussed under this framework, but no reference to energy poverty issues. Poverty in general and energy poverty is often overwrapped but different. How can we avoid people who fell into the situation of energy poverty?	Accepted. Text revised. Energy poverty should be dealt with in Ch6 (energy systems) though.	Midori Aoyagi	National Institute for Environmental Studies	Japan

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
30269	70	13	70	16	There is an important paper from Yann Robiou du Pont & Malte Meinshausen (Nature Communications (2018) 9:4810 DOI: 10.1038/s41467-018-07223-9) that analyses the consequences of individual country equity choices in setting the ambition level of their NDCs. It shows most countries pick the equity principle that is most favourable to them. This inevitably leads to missing global targets. This is something that deserves ample attention when discussing equity and constitutes to me the heart of the equity debate around meeting the Paris targets.	Noted. Will assess proposed reference	Bert Metz	European Climate Foundation	Netherlands
13373	70	26	70	26	following "individuals, communities" I would add "economic sectors" before "and societies"	Accepted. Will include mention of sectors.	Adam Pawloff	Greenpeace	Austria
46313	70	38	70	38	What is encompassed in the term 'just transition' does not need to be limited to the national definition that is implied here. International solidarity, and the equity principle apply both nationally and internationally. Just transitions and the equity principles of the UNFCCC are intertwined and should not be understood as a global vs. national view of climate strategies. Just transition concepts are widely discussed as subnational, or intra EU, social wealth distribution questions that often do not seem to apply beyond borders despite the UNFCCC similar equity and justice requirement. The AR6 is an opportunity to clarify the articulation of these two body of works that are too often understood in isolation of each other. International support is part of a just transition.	Accepted. Just transition applies both within and across borders. This is the point already made here. To be made clearer in SOD	Yann Robiou du Pont	IDDDRI	France
44185	70	38	70	44	There is a more detailed summary of the policies available to ensure a just and equitable low-carbon transition in Green and Gambhir (2019) Transitional assistance policies for just, equitable and smooth low-carbon transitions: who, what and how? Climate Policy https://doi.org/10.1080/14693062.2019.1657379	Noted. Will assess proposed reference	Ajay Gambhir	Imperial College London	United Kingdom (of Great Britain and Northern Ireland)
24987	70	46	71	1	Delete "in part to compensate ... fossil-fuel-based sectors,"	Rejected. No rationale provided for deletion	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
30285	71	10	71	10	The EU Green Deal was PROPOSED by the European Commission, but not yet adopted by the Council of Ministers and the Parliament	Accepted. Will update text based on latest developments	Bert Metz	European Climate Foundation	Netherlands
10261	71	13	71	14	Surprised not to see the Powering Past Coal Alliance in the list (Box 4.5)	Noted. Will review proposed addition	Aglaia Obrekht	Environment and Climate Change Canada	Canada
24989	71		71		Delete Box 4.5	Rejected. No rationale provided for deletion	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
28711	71	25	72	1	On the references, it is suggested that first-hand governmental sources are cited, unless the assessment of the commissions, trask forces or dialogues is central to the table.	Noted. Most reference in Table 4.8 are already government sources	Takeshi Kuramochi	NewClimate Institute	Germany
6159	73	1	73	1	Source missing from Fig. 4.10	Accepted. Caption of figure revised.	Linares Pedro	Universidad Pontificia Comillas	Spain
24991	73		73		Delete Figure 4.10 as it is not supporting the analysis presented in the associated sub-sections	Rejected. Figure 4.10 supports the point that "just transition" is a focal point for the conversation on equity. Links between the Figure and the text to be strengthened in SOD.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
34371	73	21	74	1	CCUS should be splitted into CCU and CCS: In the report, the term CCUS (Carbon Capture Utilisation and Storage) is broadly used but not clearly defined and in most cases, this term discusses only Carbon Capture and Storage (CCS) technologies (which is the case here) and not the utilisation phase. CSS and Carbon Capture and Use (CCU) distinctly differ regarding their CO2 reduction potential, the underlying technical processes and outcomes, their effects on climate mitigation, and their environmental policy targets. Therefore, presenting commingling CCS and CCU does not do justice to the specific characteristics of the two concepts and could be counterproductive for the further development particularly of CCU. Therefore the term CCUS should be separated in CCS and CCU and both options should be clearly addressed independently (REFERENCES:1 Cuéllar-Franca and Azapagic, 2015 (https://doi.org/10.1016/j.jcou.2014.12.001), 2) Bruhn et al., Environmental Science & Policy 60 (2016) 38–43, 3) Arning et al., Energy Policy 125 (2019) 235–249)	Accepted. Will revise text following IPCC guidance on terminology	Célia Sapart	Université Libre de Bruxelles et Co2 Value Europe	Belgium
2611	74	43	74	44	... "Transition Town movement, in which seek to implement a just transition" ... need to delete the word "in", i.e. "Transition Town movement, which seek to implement a just transition". Again on a personal note, I am actively engaged with my local transition town activities.	Editorial – copyedit to be completed prior to publication	Michael Czerniak	Atlas Copco - Edwards	United Kingdom (of Great Britain and Northern Ireland)
6177	75	16	75	18	but also leveraging indigenous knowledge and technology can serve as a starting point towards mitigation efforts, especially in setting where technology transfer (and institutional transplanting) has failed to engender meaningful mitigation. see: Tume, S.J.P.; Kimengsi, J.N.; Fogwe, Z.N. (2019). Indigenous Knowledge and Farmer Perceptions of Climate and Ecological Changes in the Bamenda Highlands of Cameroon: Insights from the Bui Plateau. Climate 2019, 7, 138	Accepted. Text revised. Will review proposed reference.	Jude Ndzifon Kimengsi	Department of Geography and Environmental Studies, Catholic University of Cameroon (CATUC)	Cameroon
37941	75	21	75	21	Do you mean inequity or inequality here?	Inequity. Text revised	Patricia Perkins	York University	Canada
30287	75	28	75	34	This is not a very good introduction to the links between mitigation and adaptation. Section 4.5.4 of the SR1.5 (with its supplementary materials) does a much better job in discussing this important issue. I strongly suggest to rewrite this section based on the material in SR1.5, supplemented with new literature.	Accepted. Text revised.	Bert Metz	European Climate Foundation	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
2631	75	28	75	40	In some cases the mitigation/adaptation link is far from strong. Let us take the case of dealing with sea level rise: there is hardly any mitigation here: the references to coastal ecosystems and later on restoration of mangroves (page 76 lines 36-37) are but marginally relevant. Basically this is pure adaptation, and the stakes are far from negligible: see e.g. Hinkel et al, PNAS 2014, 10.1073/pnas.1222469111. This section should therefore not insist unilaterally on the positive mitigation/adaptation link. Similarly, the repartition of tasks between national and subnational authorities sketched in § 4.5.1.1. may suffer exceptions.	Taken into account. WG2 deals with adaptation, e.g. sea-level rise. Each WG3 chapter tries to integrate mitigation and adaptation. Ch4 also needs to assess literature on the mitigation co-benefits of adaptation actions, hence mangroves. That said, we need to integrate adaptation better into our chapter in the SOD	Philippe Waldeufel	CNRS/IPSL/LATMOS	France
3005	75	31	75	34	Also note that mitigation can be a co-benefit of adaptation. A number of nations have indicated that their NDCs are centered on adaptation with mitigation outcomes as co-benefits.	Noted. We have searched literature for mitigation cobenefits of adaptation action (4.2.2.5).	Mustafa Babiker	Aramco	Saudi Arabia
35871	75	31	75	34	In many cases, mitigation led to maladaptation too, mainly in agroforestry or CDM projects, where the industries benefitted but the locals were at loss.	Accepted. Point to be added.	Himangana Gupta	Institute for the Advanced Study of Sustainability, United Nations University, Tokyo	Japan
10263	75	41	75	41	Sustainable agriculture is mitigation, therefore suggesting to change the title to " Sustainable Agriculture can have ADAPTATION co-benefits and reduce trade-offs"	Rejected. Sustainable Agriculture is largely adaptation (improving soil quality, preventing erosion and increasing crop yields and fodder). The mitigation aspect is premised mainly on making farmers become more sedentary thereby avoiding further land clearing resulting in reduced deforestation rates.	Aglaia Obrecht	Environment and Climate Change Canada	Canada
20915	75	41	76	24	This section gives an impression that findings of individual studies are simply listed without a structure. Summarizing or introductory comments on literature reviewed need to be added to paragraphs.	Accepted. Text revised	Jungmin Lin	Korea Energy Economics Institute	Republic of Korea
12663	75	34			For example afforestation/reforestation/restoration with the adaptive framework.	Noted	Eray Özdemir	General directorate of Forestry	Turkey
27771	76	19	76	20	The sentence is unclear	Accepted. Text revised	Christophe Deissenberg	Institute for non-linear dynamic inference	Luxembourg
37017	76	25	76	25	http://www.oceanpanel.org/climate can be a useful reference	Noted. Will review proposed reference	Joyashree Roy	Asian Institute of Technology, Thailand. Jadavpur University, India	Thailand
37241	76	25	76	45	This section misses an important point from the SROCC that blue carbon has limited mitigation capacity (and is associated with high uncertainties). Furthermore, the SROCC found that while coastal ecosystem based adaptation can be very cost effective, at higher levels of warming there is a risk that it will not work any more because of climate change impacts. Blue carbon is also vulnerable to reversal of carbon storage at higher warming levels. These vulnerabilities of coastal ecosystem-based adaptation and mitigation should be highlighted.	Accepted. Text revised.	Michiel Schaeffer	Climate Analytics	Netherlands
11585	76	30	76	30	should read "vegetated coastal ecosystems"	Accepted. Text revised.	John Devaey	Trinity College Dublin	Ireland
11587	76	31	76	31	Blue carbon habitats are widely recognized as saltmarsh, seagrass, and mangrove. There is no need to additionally cite deltas here	Rejected. Literature is cited specifically for deltas. Deltas are unique coastal areas receiving fluvial sediments.	John Devaey	Trinity College Dublin	Ireland
11589	76	34	76	34	Should read "The literature contains case studies of blue carbon projects"	Accepted. Text revised	John Devaey	Trinity College Dublin	Ireland
11591	76	34	76	34	Methane emissions partially offset the sequestration - this sentence is rather abrupt and needs to be addressed in more detail	Accepted. Text revised.	John Devaey	Trinity College Dublin	Ireland
1945	76	34	76	38	As we have lots of case studies about blue carbon now, citing following comprehensive blue carbon books might be better for balanced documentation : Alongi, D. M. (2018) Blue carbon: Coastal sequestration for climate change mitigation. Cham, Switzerland: Springer; Kuwae, T., & Hori, M. (2019) Blue Carbon in Shallow Coastal Ecosystems: Carbon Dynamics, Policy, and Implementation, Springer; Windham-Myers, L., Crooks, S., and Troxler, T. G. (2019) A Blue Carbon Primer: The State of Coastal Wetland Carbon Science, Practice and Policy. CRC Press.	Noted. Will assess proposed reference.	Kuwae Tomohiro	Port and Airport Research Institute	Japan
6235	76		77		Suggest including a reference to Fargione et al. since this is another study about the importance of natural options for climate change mitigation focused on the US. (Link: https://advances.sciencemag.org/content/4/11/eaat1869 , Reference: Fargione, J.E., S. Bassett, T. Boucher, S. Bridgman, R.T. Conant, S.C. Cook-Patton, P. W. Ellis, A. Falcucci, J. Fourqurean, T. Gopalakrishna, H. Gu, B. Henderson, M. D. Hurteau, K. D. Kroeger, T. Kroeger, T. J. Lark, S. M. Leavitt, G. Lomax, R. I. McDonald, P. J. Megonigal, D. A. Miteva, C. Richardson, J. Sanderman, D. Shoch, S. A. Spawn, J. W. Veldman, C.A. Williams, P. Woodbury, C. Zganjar, M. Baranski, P. Elias, R. A. Houghton, E. Landis, E. McGlynn, W. H. Schlesinger, J. V. Siikamaki, A. E. Sutton-Grier, and B. W. Griscom. 2018. Natural Climate Solutions for the United States. Science Advances.)	Noted. Will assess proposed reference.	Ariana Sutton-Grier	University of Maryland	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
6243	76		77		The section on ecosystem restoration talks almost exclusively about forests even though the previous section talks about wetlands. It would be good to make it clear that wetland restoration and protection from degradation are important, too, by adding another sentence or two with an example such as the study by Kroeger et al. 2017 in Scientific Reports (Link: https://www.sciencedirect.com/science/article/pii/S1462901115000799) that discusses the importance of restoring tidal flow to coastal wetlands as a way of halting the freshening of coastal wetlands which has led to lots of extra methane production. This is a bit different take on "restoration" and yet restoring these tidal marshes to being salt water tidal marshes instead of brackish or fresh is both important from a habitat perspective but also has really important greenhouse gas mitigation outcomes. So, I suggest adding a sentence or two about this and citing the Kroeger study since tidal restrictions are actually common in developed countries all over the world so this is a significant global opportunity for reducing methane emissions by restoring salt water tidal flows.	Accepted. Text revised	Ariana Sutton-Grier	University of Maryland	United States of America
43845	76	25			Build on SROCC Chp 5 section 5.5.1.1 for assessment of blue carbon	Accepted. Text revised.	Hans Poertner and Elvira Poloczanska	Alfred-Wegener-Institut	Germany
6237	76	30			Suggest also citing for definition of blue carbon McLeod et al. 2011 from Frontiers in Ecology and Environment (Link: https://esajournals.onlinelibrary.wiley.com/doi/10.1890/110004) and Howard et al. 20 (Link: https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/fee.1451 , Reference for Howard, J., A.E. Sutton-Grier+, D. Herr, J. Kleypas, E. Landis, E. Mcleod, E. Pidgeon, S. Simpson. 2017. Clarifying the role of coastal and marine systems in climate mitigation. Frontiers in Ecology and Environment.15(1):42-50.)	Noted. Will assess proposed reference.	Ariana Sutton-Grier	University of Maryland	United States of America
43843	76	30			See glossary definition for Blue Carbon in SROCC and Chp 5 section 5.5.1.1. - specify here you are discussing coastal blue carbon	Accepted. Text revised.	Hans Poertner and Elvira Poloczanska	Alfred-Wegener-Institut	Germany
6239	76	39			The issue of methane emissions is quite complicated and this very short sentence does not do it justice here. The data suggest that if salinity is below 18 ppt, then methane emissions are much more likely to occur and then the statement is correct that methane emissions can partially offset the carbon sequestered and hence the greenhouse gas benefits. However, when salinities are higher than 18 ppt, there is very little to no methane produced from these coastal ecosystems because sulfate reducers outcompete methanogens for carbon substrates and so sulfate reduction occurs instead of methane production. See Poffenberger et al. 2011 for the seminal study on this (Link: https://repository.si.edu/bitstream/handle/10088/17519/serc_Poffenbarger_Needelman_Megonigal_2011_Wetlands_.pdf?sequence=1&isAllowed=y) I suggest writing a couple more sentences in this section explaining the important role of salinity and citing Poffenberger (feel free to use some of the text I have written above). OR at the very least change the text to read "can partially offset... depending on salinity."	Accepted. Text revised.	Ariana Sutton-Grier	University of Maryland	United States of America
6241	76	42			Could consider citing the paper Sutton-Grier et al. Future of our Coasts here. (Link: https://www.sciencedirect.com/science/article/pii/S1462901115000799 Reference: Sutton-Grier, A.E., K. Wowk, and H. Bamford. 2015. Future of our coasts: The Potential for Natural and Hybrid Infrastructure to Enhance the Resilience of Our Coastal Communities, Economies and Ecosystems. Environmental Science and Policy. 51:137-148.	Noted. Will assess proposed reference.	Ariana Sutton-Grier	University of Maryland	United States of America
1439	77	1	77	19	Restoration is an important solution to mitigate climate change. However, there are also many damaging activities in the name of ecological restoration. Hence, to set up an international standards and principles is important for ecological restoration. Gann et al. (2019) provided the latest international principles and standards for the practice of ecological restoration. Importantly, this document also pointed out that ecological restoration needs to explicitly consider climate change. Gann G.D., McDonald T., Walder B., Aronson J., Nelson C. R., Jonson J., Hallett J. G., Eisenberg C., Guariguata M. R., Liu J., Hua F., Echeverría C., Gonzales E., Shaw N., Decler K., Dixon K.W., 2019. International principles and standards for the practice of ecological restoration. Second edition. Restoration Ecology 27 (S1): S1–S46.	Rejected. Best practice for restoration outside of scope of Ch4. May be relevant for Ch7 or for relevant chapter in WG2	JUNGUO LIU	Southern University of Science and Technology	China
17239	77	1	77	19	Please check this paragraph for the correct use of the terms "afforestation", "reforestation" and "restoration". Afforestation concerns areas formerly not covered by forests, so it usually constitutes a change in land use. Reforestation is the regeneration of forests where there has been forest previously, e.g. planting of trees following timber harvest. The paper referenced in the last sub-paragraph, for example, refers to "afforestation", not "reforestation" as you suggest. Please respect the difference.	Accepted. Will check use of terminology	Joachim Rock	Thuenen-Institute of Forest Ecosystems	Germany
37243	77	1	77	19	The limits to adaptation and mitigation that occur at higher levels of warming for ecosystem-based measures should be mentioned	Accepted. Text revised	Michiel Schaeffer	Climate Analytics	Netherlands

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
44929	77	1	77	19	4.5.2.3 Ecosystem Restoration and preventing ecosystem degradation. The Millennium Ecosystem Assessment 2005 provides extensive analysis of the importance of biodiversity in underpinning ecosystem condition and ecosystem services. Biodiversity plays a critical functional role in key evolutionary and ecological processes including adaptation to climate change. Adaptation depends on natural selection having sufficient diversity at every level to yield optimum stability and integrity to changed environmental conditions - operating on the pool of available ecosystems, species and genes to yield the characteristic biodiversity best suited to environmental conditions, which in turn generates ecosystem level outcomes that contribute to ecosystem integrity. At a time of rapid climate and other change maximising available genetic, species, habitat and ecosystem diversity is a key strategy to support natural adaptation responses. Protecting and restoring natural ecosystems is thus a critically important climate mitigation and adaptation strategy.	Noted. Not clear what change the reviewer suggests	Virginia Young	Australian Rainforest Conservation Society, Griffith University, CAN Ecosystems	Australia
24107	77	6	77	6	Tree planting "led" This is in the past tense but it appears the paragraph is dealing with what can happen. There is the need to clarify.	Editorial – copyedit to be completed prior to publication	Alfred Ofosu Ahenkorah	Ahenkorah and Partners Energy and Engineering Services Ltd	Ghana
6179	77	20	77	20	Endogenous dependent pathways for bioeconomy transition is relatively under-explored; leading to policy and institutional	Rejected. Incomplete comment. See response to Comment #6181	Jude Ndzifon Kimengi	Department of Geography and Environmental Studies, Catholic University of Cameroon (CATUC)	Cameroon
2177	77	21	77	21	Please, add the following sentence: "Carbon dioxide uptake by well-designed cement-based materials should be considered in the future climatic change models (Sanjuán et al 2020; Xi et al 2016). For instance, GGBFS cements are able to absorb a significant amount of carbon dioxide (Andrade and Sanjuán 2018; Sanjuán et al 2019)". Xi, F.; Davis, S.J.; Ciais, P.; Crawford-Brown, D.; Guan, D.; Pade, C.; Shi, T.; Syddall, M.; Lv, J.; Ji, L.; et al. Substantial global carbon uptake by cement carbonation. Nat. Geosci. 2016, 9, 880–883. https://doi.org/10.1038/NGEO2840 Sanjuán, M.Á.; Andrade, C.; Mora, P.; Zaragoza, A. Carbon Dioxide Uptake by Cement-Based Materials: A Spanish Case Study. Appl. Sci. 2020, 10, 339. https://doi.org/10.3390/app10010339 Andrade C, Sanjuán MA. Updating Carbon Storage Capacity of Spanish Cements. Sustainability 2018;10:4806. https://doi.org/10.3390/su10124806 Sanjuán, M.Á.; Estévez, E.; Argiz, C. Carbon Dioxide Absorption by Blast-Furnace Slag Mortars in Function of the Curing Intensity. Energies 2019, 12(12), 2346; https://doi.org/10.3390/en12122346	Rejected. Outside the scope of Ch4. This issue is relevant for Ch11 (industry)	Miguel Angel Sanjuán	Technical University of Madrid	Spain
6181	77	21	77	21	Endogenous dependent pathways for bioeconomy transition is relatively under-explored; leading to policy and institutional gaps in several sectors of climate mitigation and adaptation (e.g. agriculture, forestry, water). This should be pursued at multi-country levels, including the application of interdisciplinary research approaches.	Taken into account. Point about bioeconomy transition taken. However, policy and institutional gaps are for Ch13.	Jude Ndzifon Kimengi	Department of Geography and Environmental Studies, Catholic University of Cameroon (CATUC)	Cameroon
12495	77	21	77	21	Please, add this research gap: "Carbon dioxide uptake by mortars and concretes should be considered in the future climatic change models (Sanjuán et al 2020; Xi et al 2016). Xi, F.; Davis, S.J.; Ciais, P.; Crawford-Brown, D.; Guan, D.; Pade, C.; Shi, T.; Syddall, M.; Lv, J.; Ji, L.; et al. Substantial global carbon uptake by cement carbonation. Nat. Geosci. 2016, 9, 880–883. https://doi.org/10.1038/NGEO2840 Sanjuán, M.Á.; Andrade, C.; Mora, P.; Zaragoza, A. Carbon Dioxide Uptake by Cement-Based Materials: A Spanish Case Study. Appl. Sci. 2020, 10, 339. https://doi.org/10.3390/app10010339 Sanjuán, M.Á.; Estévez, E.; Argiz, C. Carbon Dioxide Absorption by Blast-Furnace Slag Mortars in Function of the Curing Intensity. Energies 2019, 12(12), 2346; https://doi.org/10.3390/en12122346	Rejected. Outside the scope of Ch4. This issue is relevant for Ch11 (industry)	MORA PERIS PEDRO	Profesor Titular de Universidad de la ETSI Minas y Energía de la Universidad Politécnica de Madrid	Spain
28713	77	21	77	21		Accepted. General point of gap on smaller countries noted, not specific cases. Will make unequal distribution of literature clearer in SOD.	Takeshi Kuramochi	NewClimate Institute	Germany
6247	77	3			I suggest making it very explicit that avoiding the destruction of coastal wetlands is particularly important because the avoided losses of greenhouse gases to the atmosphere can be very substantial given how much carbon is stored in the soils (you can cite Howard et al for this if need be).	Accepted. Text revised.	Ariana Sutton-Grier	University of Maryland	United States of America
6233	77	5			Afforestation reduces... need to add the S	Editorial – copyedit to be completed prior to publication	Ariana Sutton-Grier	University of Maryland	United States of America

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
6245	77				I think it is worth mentioning in this section on ecosystem degradation and restoration that one thing that needs to be improved in countries all around the world is the tracking of coastal wetland loss AND the tracking of coastal wetland restoration. Where is the destruction or degradation happening? How much acreage is being lost? And due to what human practices (or is it due to Sea level rise?)? Or if restoration is occurring, how much and where? These are really important factors in being able to better track the greenhouse gas emissions (from loss) and sequestration (from restoration). I think a simple statement that says it is really important to track the loss and restoration of ecosystems including coastal wetlands will address this. Of note, however, the IPCC in the Wetlands Supplement suggested that countries include all wetlands including coastal wetlands in their greenhouse gas inventories. Only a few countries responded to the IPCC request including the US. The US included coastal wetlands in its national GHG inventory for the first time in 2017 and continues to do so. This helps the US better track where and how much coastal wetland is being lost and where it is being restored. Might be worth adding a sentence about this and how including coastal wetlands in the inventory helps the US track its coastal wetland resources. See Crooks et al. "Coastal wetland management as a contribution to the US National Greenhouse Gas Inventory" for details of the US process (link: https://www.nature.com/articles/s41558-018-0345-0.epdf?author_access_token=f0Q1sbtgJ2oFNz1cWd77r9RgN0jAJWel9jnR3ZoTv00M1uVbjgMRx11x9_IWZ2XxeIl2hgPL7psBHBh69Q5msgXLaHnoZhV8Gfk0c2ySmnqpg1xCioojKMe1ZaulnSNHMPRZ9dyZ1KNRvJ4Wt81cg%3D%3D).	Rejected. Out of scope of Ch4. Measurement issues associated with coastal wetland are relevant for Ch7 or for the relevant chapter in WG2	Ariana Sutton-Grier	University of Maryland	United States of America
32315	125	2	125	3	Two references must be added before line 3 : Berger, A. et al., 2017a: Nuclear energy and bio energy carbon capture and storage, keys for obtaining 1.5°C mean surface temperature limit. International Journal of Global Energy Issues, 40(3/4), 240, doi:10.1504/IJGEI.2017.086622. Berger, A. et al., 2017b: How much can nuclear energy do about global warming? International Journal of Global Energy Issues, 40(1/2), 43, doi:10.1504/IJGEI.2017.080766.	Noted. Will assess proposed reference.	Jean-Luc SALANAVE	Ecole Centrale-Supelec, Paris, France (professor, energy systems)	France
4987					It is important to consider the SDGs in the formulation of the strategic plans of the countries. Incorporate green and blue infrastructure, contribute to resilient societies, payment for environmental services, water security. With small, well-controlled local actions, global goals can be achieved to adapt to CC.	Noted. SDGs are considered in the FOD and will further be considered in the SOD. Not clear where the reviewer suggests.	MARIA DEL VALLE MORRESI	UNIVERSITY	Argentina
9389					no comments have to be addressed	Noted.	ANNA LAURA PISELLO	DEPARTMENT OF ENGINEERING - UNIVERSITY OF PERUGIA, ITALY	Italy
17733					An excellent and well-focused chapter. I remain very uncomfortable with the phrase 'mid-term' when, for example, the finance community considers long term to mean 3-5 years hence, anything beyond is 'very long term'. Why not simply be explicit and say 'mid-Century'? In a surprising majority of cases, one could simply substitute the words, in titles and text, and it simply makes it more clear and explicit	Rejected. Timeframes were agreed for WG3 as a whole, balancing various perspectives. Title of Ch4 given by IPCC plenary.	Michael Grubb	UCL - Institute of Sustainable Resources	United Kingdom (of Great Britain and Northern Ireland)
24957					Executive Summary and other sections of the chapter (e.g. 4.6 on research gaps) to be added	Accepted. Text revised.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
24965					Define clearly "cost-effective long-term mitigation pathways"	Accepted. Text revised.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
24967					Should the GCoM listed on page 22 as part of Table 4.3 be presented twice?	Accepted. Text revised.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
24975					Analysis presented for specific regions/countries should be carefully revised - at present, it occasionally can be considered as policy prescriptive (e.g. section 4.2.5)	Taken into account. Will review chapter for prescriptive language.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
24979					When referring to subsidy reforms these should relate to inefficient subsidies	Rejected. At this broad level of generality (this comment is not tied to a specific sentence in the text), subsidies can both help/hinder climate mitigation, depending on what is being subsidized.	Eleni Kaditi	Organization of the Petroleum Exporting Countries (OPEC)	Austria
25519					Please take care not to use value-judgement terms such as 'important', 'significant' and also prescriptive terms such as 'need' and 'must'. Some readers will interpret these statements as policy prescriptive.	Taken into account. Will consider use of these words carefully. In some cases, however, these qualifiers stem directly from the literature itself.	Sarah Connors	IPCC WGI TSU	France
25553					As a reader who isn't familiar with all the topics being discussed in your chapter, it might help many Executive Summaries to include subheadings to cluster the statements by topic or overarching chapter themes.	Taken into account in writing Exec. Sum for SOD.	Sarah Connors	IPCC WGI TSU	France
25581					Please consider including a paragraph covering Short-Lived Climate forcers in the executive summary. SLCFs are a cross-Working Group topic that are responsible for key differences in mitigation pathways and how global temperatures can respond. For example, please see the WGI SOD chapter 6 and Sections C and D of the WGI SPM.	Rejected. Influence of short-lived climate forcers on temperature is an issue for Ch3.	Sarah Connors	IPCC WGI TSU	France
29033					100% RE5 scenarios for power and energy sector are missing. E.g for Reviews/Perspectives on aspects of 100% renewables Hansen et al.: https://www.sciencedirect.com/science/article/pii/S0360544219304967 ; Brown et al.: https://www.sciencedirect.com/science/article/pii/S1364032118303307	Rejected. While 100% RE scenarios are included as part of the accelerated mitigation pathways considered in 4.2.5, detailed discussion of 100%RE scenarios (and of associated issues) is the purview of Ch6 (energy systems)	Arnulf JÄGER-WALDAU	European Commission, JRC	Italy

Comment ID	From Page	From Line	To Page	To Line	Comment	Response	Reviewer Name	Reviewer Affiliation	Reviewer Country
29035					The assumptions of cost developments for PV in the IAMs are not up to date. This leads to erroneous conclusions. See Krey et al. (https://www.sciencedirect.com/science/article/pii/S0360544218325039) summarizing the PV cost in all relevant IAMs vs Vartiainen et al. (https://onlinelibrary.wiley.com/doi/full/10.1002/ptp.3189). Factor 4 difference	Rejected. This is a comment for Ch3.	Arnulf JÄGER-WALDAU	European Commission, JRC	Italy
29509					Section 4.2. P42 on Development Pathways and shifting development pathways: -The approach is very important and merited, the question is: how much of an overlap is there with sustainable development chapter 17?	Accepted. CLAs of Ch4 and 17 are discussing concept of shifting development pathways, to improve consistency and reduce overlap.	Alaa Al Khourdajie	IPCC WGIII TSU	United Kingdom (of Great Britain and Northern Ireland)
33119					Good	Thank you	Edris Alam	Rabdan Acadmey	United Arab Emirates
37001					Very nice to read the chapter. However, as one reads through sections /subsections one gets convinced that the dominant view that development pathway choice drives emission but danger in this is that it makes one to forget that percapita consumption/emission /income /i.e., consumption side is equally important besides development pathwhay choice which is nicely captured in chapter 1 , Fig 1.2. One suggestion can be to upfront make it clear what does development pathway means choice of production, consumption, which nfact comes much later in the chapter while defining SDP	Accepted. Ch4 CLAs discussing with Ch1 the concept of shifting development pathways, and will look at Fig.1.2 and consider implications for framing Ch4.	Joyashree Roy	Asian Institute of Technology, Thailand. Jadavpur University, India	Thailand
38873					The full chapter lacks of explicit discussion over the significance, possibility and how to enhance the NDCs for the coming period	Noted. We are aware of new and enhanced NDCs, see p 12, lines 7-9. However, COP26 has been postponed (after FOD and review), so there will be no peer review literature to assess, and probably not a full set of NDCs	Xiusheng Zhao	Tsinghua University	China
43975					Coordination with WGII chapters such as 18 as well as development of a Cross Working Group Box on Climate Resilient Development should be investigated.	Rejected. We actually agree with the proposition, but establishing x-WG links is beyond the mandate of Ch4. Ch4 did attend a virtual discussion on CRDP, which may lead to a x-chapter box.	Hans Poertner and Elvira Poloczanska	Alfred-Wegener-Institut	Germany
43977					With respect to emission cuts the chapter does not seem to be fully in line with climate targets of the Paris agreement or scenarios discussed by SR 1.5, or avoidance of the risk thresholds reported by WGII and the Special Reports. Any variability in reference points should be clearly mentioned, consequences for global mean temperature and potential overshoot be considered as well as ideally, in exchange with WGII, impacts and their costs, compared to costs of mitigation and adaptation.	Rejected, not supported by peer-reviewed literature. Ch4 assesses literature on mitigation, regardless of target.	Hans Poertner and Elvira Poloczanska	Alfred-Wegener-Institut	Germany
44203					No comments	Noted	maguy EUGENE	French National institute on Agriculture Food and environment, INRAE	France
46379					It is hard for the reader to follow and understand when overall statements with term like 'robust evidence, high agreement' (e.g. page 4-4 line 32-34, p. 4-6, l. 43-44) can be given and when they cannot be given. Each chapter need to include an explanation of this, and the terms used.	Rejected. We agree that explanation would be helpful, but this is for WG3 as a whole.	Henrik Carlsen	Stockholm Environment Institute	Sweden
48007					I apologize but could not read all chapters so my comment only arises from the table of content (it is a pity that no ES is available for this FOD). I note a thin line between a neutral assessment and a prescriptive tone (what needs to be done on the near term). We will have to integrate information about the changing climate and the expected impacts on the near term with this chapter, I hope that coordination with WGI and WGII will take place so as to address mitigation not disconnected from the physical world. Finally, I stress the issue of nature based solutions as important to integrate climate change and biodiversity conservation policies (with a sense of urgency given the rate of loss of ecosystems). I hope that this can also be considered in development pathways (which need to consider ecosystems functions and services supporting human societies in a changing climate). In the final part of the chapter, it is not just about adaptation but also about impacts, losses and damages (material and immaterial). Finally, I hope that enabling conditions assessed in this chapter for accelerating mitigation in the near term include the role of climate change literacy, education and training.	Taken into account. We will write an Executive summary, seek to balance tone; coordination with WG1 is perview of WG3 bureau; impacts, loss and damage are relevant for WG2; We use 6 enabling conditions from SR1.5 and will consider education at a more granular level	Valérie Masson-Delmotte	CEA, IPSL/LSCÉ	France