Comment No	From Page	From Line	To Page	To Line	Comment	Response
40791	0		0		Please see my general remarks on the report and those on the SPM. I appreciate the developments of chapter 6 from the FOD. Chapter 6 is addressing all the elements identified during scoping. The narrative works well. [Valerie Masson-Delmotte, France]	Thank you
25809	0	0			General comment on Chapter 6 We welcome the crossover approach used in Chapter 6. We suggest that the analysis of the available scientific literature be refined, since several additional studies could be used to better assess the effects of some land-based options on other sustainable development objectives, for example on the links between REDD+ and food security, or the adaptation benefits associated with material substitution. These studies are indicated in various comments made throughout Chapter 6. [, France]	We already have 68 pages of references so we have to be selective of the primary literature - we have added interactions where possible
7335	0				Congratulations to the author team for producing a chapter which synthesises a lot of complex material in a way that is easy to read and understandable for policy makers. [Debra Roberts, South Africa]	Thank you
6393	0				Thank you to the authors for this comprehensive chapter, which covers a lot of material. A general comment is that there is some repetition with other chapters, so some cross-referencing would be useful. Also there is very little in the executive summary about adaptation options, and statements are rather general. [, Gambia]	We have addressed the cross-referencing issue
27217	0				As part of the New York Declaration on Forests companies have committed themselves to deforestation-free supply chain. However, deforestation-free supply chain appears to be missing as a demand-side measure in this report (e.g., Table 6.2, yellow lines, chapters 6.3.2 and 6.5.2). We consider an assessment of this issue to be very important and kindly ask the authors to amend chapters 6 and 7 accordingly. Please see the following references: - FAO "Zero deforestation initiatives and their impacts on commodity supply chains", http://www.fao.org/3/a-i6857e.pdf; - Sabine Henders, U Martin Persson and Thomas Kastner: "Trading forests: land-use change and carbon emissions embodied in production and exports of forest-risk commodities", Environ. Res. Lett. 10 (2015) 125012 doi:10.1088/1748-9326/10/12/125012; - European Commission: The Impact of EU consumption on deforestation Comprehensive Analysis on the Impact of EU consumption on deforestation, technical report 2013 – 065." [, Germany]	We have added reference to these initiatives
27219	0				Please clarify the structure of the chapter by changing the titles of the sections and subjections, please avoid the current similarities in the titles of subjections to 6.3 and 6.5. It would also be useful to improve the explanation of the difference between chapters 6 and 7 in the current version (page 6, lines 22-25 are not clear enough). There is also some duplication in the two chapters and with chapter 5, and we would be grateful if these could be removed to improve readability and facilitate manoeuvring within the text. Please provide references to chapter 7 wherever possible. [, Germany]	Duplication removed by cross-referencing. Title names revisited
27221	0				We strongly encourage the authors to complement the assessment presented in chapter, in particular in section 6.4., with one more response option: The option of "inaction" beyond actions in place today. This would put the information and figures in context and convey the message that although some of these response options do come at a certain disadvantage doing nothing might not be an option. [, Germany]	This is not a response option - rather a counterfactual - and it really belongs in Chapters 1 and/or 7. We have passed the comment on Ch1/7

Comment No	From Page	From Line	To Page	To Line	Comment	Response
27223	0				Despite broad assessment of very recent literature on risk insurance instruments, particularly in a developing country context with a focus on index-based insurance, in chapter 7 as well as SR1.5's chapter 4, the assessment of chapter 6 (particularly 6.5.3.7) of the co-benefits and adverse side-effects seem to mainly draw on commercial crop insurances in the US and related literature. The authors are strongly encouraged to ensure consistency across the chapters and Special Reports. [, Germany]	Section revised
33765	0				Ch. 2-5 brings up a number of factors and feedbacks that are involved in climate forcings, including albedo, water retention, carbon retention and methane decomposers in upland soils. For instance, these are summarized in section 2.6.2.1. Thus, we also know that these cycles can be managed for the sake of mitigation. However, in the holistic assessment of various response options in ch.6. (which is generally very much appreciated), perspectives on mitigation falls down to GHG emissions only. Consider including biogeophysical factors that are relevant for mitigation, as well as difficulties over metrics to represent such factors. [, Norway]	We do cover some non GHG climate forcings - but we have now complemented the text with more examples
33767	0				Could you please consider the consistency between the different chapters related to strategies for livestock management. Mostly, the idea for "improved livestock management" in ch. 6 (see for instance 6.3.2) is to reach higher yield per unit of input/emissions. Thus, there is an idea for "output-optimization". Similarly, in discussions over diets in ch. 5 and 6, assessment is also exclusively output-oriented, focusing on emissions per unit of output. On the other hand, the livestock sector is naturally also at the center for proposals "improved grazing land management" and "avoided conversion of grassland to cropland". Further, in chapter 5 (See 5.5.1.4,5.6.3) we are presented with "integrated responses to crop and livestock". In these proposals, some of the idea is that livestock can utilize resources that are otherwise wasted. Lastly, from chapter 2, for instance in p 103 line 23-25 it is clear that grassland can also have other merit for climate compared to other land use. Consider therefore a cross section box on livestock assessing merits of an output-optimized approach (i.e. emissions per unit output) compared to an input-optimized approach (i.e. including grazing land management, grazing strategies that are helpful for soil carbon, use of marginal resources, use of water and grasses from regions where such resources are plentiful etc.). [, Norway]	Text improved - but cross section box not added
32555	0				The chapter could benefit from being more quantitative in its assessment. This would make the findings more useful. [Helene Muri, Norway]	Perhaps the reviewer missed section 6.4 which is entirely quantitative - see tables in that section
32557	0				There is quite a bit of repetition in this chapter of content already established in earlier chapters of the report. The chapter would overall benefit from tightening up the content and cut some redundant material already mentioned. [Helene Muri, Norway]	We have addressed this issue by better cross-referencing to other chapters
34055	1	1	1	1	Identical comment to chapters 1, 5 and 6: As mentioned above, there is large overlagp between chapters withou cross-referencing. The potential contribution of dietary change to mitigation is shown in 6.4.1.2, and in 5.5.2.1 and in 1.4.2.2, without referencing the other section, and apparently written completely independently. it is not even clear what the "main" location for the diet potential is in the report. [Elke Stehfest, Netherlands]	We have improved cross-referencing between chapters

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7369	1	1	1	1	Estalishment of cooperatives and unions with equal presentation man and woman along with youngsters should be encouraged for land use decisons. Politicians decison power on land use management should be limited. [Erhan Akca, Turkey]	This is policy prescriptive and not really the purview of Ch 6 (more about ch 7)
25649	1	1	1	1	We welcome the consideration of the nature's contributions to people (NCP) in the findings of Chapter 6. [, France]	Thank you
12769	1	1	1	1	The references sometimes have the comma after the name and before the year and some times they do not have it [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
12775	1	1	1	1	The use of parenthesis for the references is not always consistent throughout the chapter [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
25575	1	1	1	4	We welcome the crossover approach used in Chapter 6. We suggest that the analysis of the available scientific literature be refined, since several additional studies could be used to better assess the effects of some land-based options on other sustainable development objectives, for example on the links between REDD+ and food security, or the adaptation benefits associated with material substitution. These studies are indicated in various comments made throughout Chapter 6. See GEN COM ON CHAPTER 6 [, France]	We have provided more references where possible, but we already have 68 pages of references, so we have to limit somehow
1305	1		174		In general the chapter is very nicely written and no more changes needed now. [Pushp Raj Tiwari, United Kingdom (of Great Britain and Northern Ireland)]	If only the other >1400 comments agreed. We appreciate the supportive comment, but we have made further changes to address the comments of other reviewers.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22723	1	1			The executive summary is careful in not mentioning response options that have much larger potential benefit than others. This is laudable as the uncertainty on effect sizes is very high. Nevertheless, it is exactly this information on the benefit of individual response options that is needed to make proper investments and identify those options that are 'fiddling in the margin'. Table 6.5 to 6.18 nevertheless attempt such a quantification and in general even give high agreement levels to the numbers. However, these numbers may be extremely misleading and are not comparable. Some apply to implementing a response option to all agricultural land currently available while others only to areas where there is high potential. There is large unclarity on these differences in underlying assumptions. The dietary change option potential is highly underestimated as it is only a conversion to 'healthy' diets and not more extreme options like vegetarian or vegan diets. While for some of the physical measure like application of rock to have increased weathering very far reaching (and incredibly non realistic assumptions are made). One option is to delete these tables from the chapter as they are not comparable. This is not the preferred option as a comparison is extremely important and exactly the contribution this report could make. It would be useful to document the range of estimates in the literature with the assumptions on the level of implementation of the option. There is a lot of literature on the important options, i.e. the range of benefits from 'nationally recommended diets' to 'full vegan' diets would help explain the potential of such an option and, at the same time, give an indication of what would be needed to reach such a benefit. Same for incraesed organic matter content, here a range based on different measures could be given across the feasible to full agricultural area to give a more detailed indication. Also, numbers per ha and per person of the measures would be important as it makes it more easy to really compare the measures. Such an analysis will also better reveal the knowledge gaps and could make the executive summary more specific and avoid investment in those measures where little benefits (and potentially large tradeoffs) are expected. [Anastasios Kentarchos, Belgium]	We have attempted to show the scale of the efficacy (quantitatively in the tables in section 6.4 and in the summary arrows in section 6.5) of the meaures. We have not removed the tables.
22725	1	1			The executive summary of this chapter does not sufficiently indicate the evidence and the potential of some of the options to move forward towards implementation. The point on page 5 line 7 is important in this respect, here it is clearly stated that 'cost-effective no/low regrest options are available for immediate local application. One example is provided. This point should be prioritized and the options that are found under this should be mentioned. The chapter itself could place more attention to the literature evidence of the barriers to implementation found for this option. Such knowledge is needed for implementation of these favoured options. [Anastasios Kentarchos, Belgium]	The ES has ben made more explicit in terms of examples and quantification - and the uncertainty language has been updated throughout
22727	1	1			The chapter is inconsistent in treatment of land-based challenges. In section 6.2 other challenges are described as in the following sections and the final assessment (which logically follow the chapter structure of the report). Furthermore, in the intro the provisioning of ES/NCPs is mentioned but it is not treated similar to the other land challenges but rather at the end of the chapter seperately. While acknowledging that NCPs are multiple which does not fit the simple coding of the other land challenges it would be good to integrated this in a single treatment of the options. Also the other land challenges can be decomposed: food security also has multiple dimentions (nutrition, quantity etc.) [Anastasios Kentarchos, Belgium]	All of the response options can be decomposed into many sub-categories - but we already cover 42 options (40 now in the FD). Going to the next level of granularity would lead to many 100s of options and would be impossible to synthesise in a way that would be useful for policy makers, so we have declined to make this change - instead we have provided more nuance in the 40 reponse options we do cover - see new tables in section 6.3

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22729	1	1			The option descriptions in the text and the descriptions of tradeoffs is full of subjective language ('largest potential'/ 'likely to be very small') and other phrases that are not well balanced between the options and not grounded in the debate in the literature. Most is based on the level op implementation of these options in the Integrated Assessment Models rather than on underlying science on these options and literature on the large tradeoffs is ignored. At many places the preference of the authors is visible in relation to their own background. Careful editing of the text is needed to provide more objective and broader evidence for some of these statements. [Anastasios Kentarchos, Belgium]	Perhaps the reviewer missed section 6.4 which is entirely quantitative - see tables in that section. All language is calibrated against the quantitative thersholds given in that section. A very small fraction of the text refers to Integrated Assessment Models
22731	1	1			Tables 6.4 to 6.15 and the supporting text of these tables provide citations for the estimates in the tables. However, these seem to be cherry-picked from the liteature ignoring the wider literature. As these tables provide essential information on which policy decisions may be based they really need to reflect the full literature and systematic reviews of the numbers presented from the wider literature including variation in assumptions need to be made. [Anastasios Kentarchos, Belgium]	The references providing the evidence used in the table have been expanded
24883	2	24	2	25	Section 6.5.4 Subheader is too long, revise (it tries to tell a full story of the subsection… make it shorter) [Justice Issah Musah Surugu, Germany]	Subheading revised
24885	2	26	2	26	section 6.5.5 has subheaders from 6.5.5.1 t0 6.5.5.3 in the main text (see, P97-104). However, the table of content didn't capture them. Update the table of content to reflect these [Justice Issah Musah Surugu, Germany]	IPCC standard format to go to level three subheadings and not beyond
25577	3	1	3	1	We suggest that the level of confidence between the different statements given in the executive summary of this chapter and the statements contained in section 6.5 be made more consistent. [, France]	All uncertainty statements have been revisited and revised
25579	3	2	3	2	To avoid any confusion with "response measure" from UNFCCC negotiations, another wording should be used. "Land-based options" or just "options" could be a workable solution. [, France]	Title defined by approved IPCC chapter outline
21243	3	2	3	2	a clearer phrasing may be 'response options to address the land challenges of (...) have interlinked implications; (...) or 'the implications of response option to (...) are interlinked' [, United Kingdom (of Great Britain and Northern Ireland)]	Wording changed
12231	3	2	3	2	Please make sure readers understand immediately what is meant by "land challenges". [Hans Poertner and WGII TSU, Germany]	Defined in glossary - but also now explained here
9967	3	2	3	2	Explain your definition of response options up front. From p20 it seems that you class some interventions as response options and other measures as overarching goals, overarching frameworks and overarching targets [Jean-Luc Chotte, France]	Defined in glossary - but also now explained here
22735	3	2	3	4	Please amend the end of the bold heading as follows: "other problems, such as biodiversity loss (robust evidence…" [Anastasios Kentarchos, Belgium]	Done
3367	3	4	3	5	I would suggest to use "high confidence" to replace (robust evidence, high agreement) and hereafter to follow the judement and expression of 《Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties》. [Rongshuo Cai, China]	Done
21245	3	5	3	6	could just say 'the above land challenges' instead of repeating the list. also, maybe 'many of the response options available to address the above land challenges have impacts across more than one challenge. [, United Kingdom (of Great Britain and Northern Ireland)]	Done
5673	3	6	3	7	"many have impacts across more than one challenge" needs to be clear [Sanaz Moghim, Iran]	Reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22737	3	7	3	9	"Some response options deliver co-benefits across a range of challenges; for example many sustainable land management practices co-deliver benefits to climate change mitigation and adaptation, preventing or addressing desertification and land degradation, and food security" To avoid any confusion due to punctuation it could read: "…preventing or addressing desertification and land degradation, and ensuring or increasing food security" [Anastasios Kentarchos, Belgium]	Reworded
27227	3	7	3	10	From SPM table 1 we learned that the majority (at least more than 32 out of approx. 40) of response options only feature co-benefits and no trade-offs. We also understood that sustainable land management practices follow a holistic approach aiming at delivering co-benefits instead of only improving one issue while worsening others. We suggest that these facts be reflected by a more precise language and therefore propose the following amendment to the sentence "majority of response options" (not "some") and "most SLM practices" (not "many"). [, Germany]	Reworded
9969	3	11	3	11	and throughout: presumably "climate mitigation" means climate change mitigation - use accurate terminology [Jean-Luc Chotte, France]	Wording changed
39761	3	11	3	13	Does this assume no significant changes in diet and associated demand for land? If so, that should be said explicitly. It is often a hidden assumption that does not serve anyone well. [, United States of America]	Wording changed
21247	3	15	3	15	no need to repeat that land is a finite resource [, United Kingdom (of Great Britain and Northern Ireland)]	Wording changed
9971	3	16	3	17	The NCP language is really awkward Use the more widely recognised and meaningful term ecosystem services throughout the chapter. [Jean-Luc Chotte, France]	Decision at Bureau level to use NCP categorisation - other reviewers welcome it
22739	3	17	3	17	"…Nature's Contributions to People" Why is this capitalized? (also elsewhere in text) [Anastasios Kentarchos, Belgium]	Capitalised because it stands for NCPs
17719	3	17	3	17	Nature's Contributions to People is one framing, Ecosystem services another, with some disagreement across the community. The latter may be more familiar to many readers. Should consider choice of framing, or cite both. Cf. Cross-Chapter Box 7, as well as section 7.6 in which NCP is termed "emerging". [, Sweden]	Decision at Bureau level to use NCP categorisation - other reviewers welcome it
160	3	19	3	19	BECCS is undefined. [Tommy Wiedmann, Australia]	spelled out here
15195	3	20	3	22	value-chain measures, including dietary shift and waste reduction, should be included as options unlimited by land competition constraints [Daniel Zarin, United States of America]	Done
21545	3	21	3	21	Please be sure to clarify whether you mean soil organic matter or soil organic carbon. It would be useful to include a definition of the term(s) in the glossary. Also clarify elsewhere whether the terms soil carbon and soil organic carbon are meant to be synonymous (in which case, use one consistently). [Andy Reisinger, New Zealand]	Now use soil organic carbon throughout
22741	3	21	3	22	The example provided of increased organic matter content of soils is not necessarily the best example for this as increased soil organic matter content as adverse yield effects may, under certain conditions, lead to displacement and larger carbon losses. On page 22 line 16-18 this is exactly mentioned. Therefore, the example should be qualified. Also, the scope could include reduction of losses of OM, not just increases. [Anastasios Kentarchos, Belgium]	Statement now nuanced

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9961	3	21	3	22	The example provided of increased organic matter content of soils is not necessarily the best example for this as increased soil organic matter content as adverse yield effects may, under certain conditions, lead to displacement and larger carbon losses. On page 22 line 16-18 this is exactly mentioned rendering this invalid as a good example [Jean-Luc Chotte, France]	Statement now nuanced
23463	3	23	3	25	The variation in situations, responses and impacts can be framed in a meaningful fashion by majot type of farming systems (in the FAO/World Bank classification, 72 in 6 regions) which bring together land, crop-livestoc-tree patterns, livelihood patterns where interlinkages can be discussed in a more useful way [John Dixon, Australia]	There are many ways to categorise these options - but they are not all to do with farming so this suggestion would not work well for e.g. vlaue chain interventions
21249	3	23	3	32	This para needs better summarisation - it doesn't need to keep repeating that impacts are location specific for example. [, United Kingdom (of Great Britain and Northern Ireland)]	Reworded
2885	3	24	3	27	Should note that the non-GHG pathways through which land use affects climate are more location specific than those involving GHG emissions. [David Kaimowitz, Nicaragua]	Reworded
22743	3	28	3	29	Further, for some scalable response options, large global impacts are seen only when implemented at large scale." What are small global impacts? Remember that large refers to area (extent) or scope and global should be sufficient. Maybe "…notable global impacts…"? Also, consider potential misinterpretation of large vs small scale; it can mean great detail (but small area) or over large areas (with less detail). [Anastasios Kentarchos, Belgium]	Reworded
34001	3	33	3	40	The text of the section just states in the last sentence that effects on all challenges simultanously need to be considered to optimize co-benefits. However, as sseparate section should be introduces stressing the need to implements response options together to maximize co-benefits and to minimize leakage or adverse side-effects. There is a growing body of literature stressing that measure that increase the pressure on land need to be combined wiht measure that decrease the pressure on land (see next comment for references). e.g. increaseing crop yields might deliver less than intended on food security and land sparing/mitigation, as it will also trigger lower prices and increased demand. Likewise for demand changes, especially when occuring in single regions, will only have half of the possible benefit due falling prices and increasing demand elsewhere ("leakage"). [Elke Stehfest, Netherlands]	Reworded to include these synergies
34003	3	33	3	40	the need to combine options that decrease with those increasig the demand for land is stressed in these publications: LeClere et al. in review, PBL 2010, [Elke Stehfest, Netherlands]	Reworded to include these synergies
21251	3	36	3	36	proposed to address a specific land challenge'…instead it would be better to say 'without consideration of other response options/challenges? Or without coordination/consideration of overlaps? [, United Kingdom (of Great Britain and Northern Ireland)]	Reworded
39763	3	38	3	40	The text reads: "Considering the impact of response options on all land challenges simultaneously will allow co-benefits to be maximised and adverse side-effects to be minimised (medium evidence; high agreement)." While logical at one level, it comes across as naive in a document intended to inform policy because the challenge of inter-Ministerial cooperation in many, many countries is so daunting. At a minimum, that challenge needs to be acknowledged here, as well as addressed more fully in other parts of the report. [, United States of America]	Caveat noted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22745	3	41	3	41	here 'over 40 in total' is mentioned as the number of available response options. This number is not indicative as some response options are classified as groups, others are kept separate. At least it should be mentioned (40 out of the # options considered here) or similar language. Alternative phrasing could be: A large number of different response options are available that .... [Anastasios Kentarchos, Belgium]	Reworded
17721	3	41	3	41	Probably unnecessary, and confusing, to cite the number of response options here. The number of options does neither say very much about the geographical spread of possible application, potentials, etc. [, Sweden]	Reworded
12233	3	41	3	41	Can you help readers to understand what these more than 40 response options are, where they come from, where they are listed or who defined or described them? Are they an outcome of your assessment? "Land-related" goals might also need to be described more precisely. Is this a reference to the SDGs? [Hans Poertner and WGII TSU, Germany]	See section 6.3
9963	3	41	3	41	here 'over 40 in total' is mentioned as the number of available response options. This number is not indicative as some response options are classified as groups, others are kept separate. At least it should be mentioned (40 out of the # options considered here) or similar language. Alternative phrasing could be: A large number of different response options are available that .... [Jean-Luc Chotte, France]	Reworded
21253	3	41	3	42	Instead of saying, some are not currently widely implemented, a better message might be that there is considerable scope for wider deployment of options (particularly the no/low regret ones); this is also an important message and should be lifted to the SPM. Also, the 2nd sentence seems to repeat the 1st in this paragraph. [, United Kingdom (of Great Britain and Northern Ireland)]	Reworded
39765	3	41	3	42	The two clauses in this sentence do not fit together very well. [, United States of America]	Reworded
22747	3	43	3	43	The majority is too positive in the context of 'across the range of land challenges'. There are many with tradeoffs identified and these are very important. The current phrasing underestimates the importance of these tradeoffs [Anastasios Kentarchos, Belgium]	We have assessed trade-offs quantitatively in section 6.4
9965	3	43	3	43	The majority is too positive in the context of 'across the range of land challenges'. There are many with tradeoffs identified and these are very important. The current phrasing underestimates the importance of these tradeoffs [Jean-Luc Chotte, France]	We have assessed trade-offs quantitatively in section 6.4
28439	3	1	4	23	The executive summary of this chapter does not sufficiently indicate the evidence and the potential of some of the options to move forward towards implementation. The point on page 5 line 7 is important in this respect, here it is clearly stated that 'cost-effective no/low regrest options are available for immediate local application. One example is provided. This point should be prioritized and the options that are found under this should be mentioned. The chapter itself could place more attention to the literature evidence of the barriers to implementation found for this option. Such knowledge is needed for implementation of these favoured options. [Barron Joseph Orr, Germany]	More examples and quantification has been added to the ES

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9937	3	1	4	23	The executive summary is careful in not mentioning response options that have much larger potential benefit than others. This is laudable as the uncertainty on effect sizes is very high. Nevertheless, it is exactly this information on the benefit of individual response options that is needed to make proper investments and identify those options that are 'fiddling in the margin'. Table 6.5 to 6.18 nevertheless attempt such a quantification and in general even give high agreement levels to the numbers. However, these numbers may be extremely misleading and are not comparable. Some apply to implementing a response option to all agricultural land currently available while others only to areas where there is high potential. There is large unclarity on these differences in underlying assumptions. The dietary change option potential is highly underestimated as it is only a conversion to 'healthy' diets and not more extreme options like vegetarian or vegan diets. While for some of the physical measure like application of rock to have increased weathering very far reaching (and incredibly non realistic assumptions are made). One option is to delete these tables from the chapter as they are not comparable. This is not the preferred option as a comparison is extremely important and exactly the contribution this report could make. It would be useful to document the range of estimates in the literature with the assumptions on the level of implementation of the option. There is a lot of literature on the important options, i.e. the range of benefits from 'nationally recommended diets' to 'full vegan' diets would help explain the potential of such an option and, at the same time, give an indication of what would be needed to reach such a benefit. Same for increased organic matter content, here a range based on different measures could be given across the feasible to full agricultural area to give a more detailed indication. Also, numbers per ha and per person of the measures would be important as it makes it more easy to really compare the measures. Such an analysis will also better reveal the knowledge gaps and could make the executive summary more specific and avoid investment in those measures where little benefits (and potentially large tradeoffs) are expected. [Jean-Luc Chotte, France]	We have added more examples to the ES to emphasise the most promising options
9939	3	1	4	23	The executive summary of this chapter does not sufficiently indicate the evidence and the potential of some of the options to move forward towards implementation. The point on page 5 line 7 is important in this respect, here it is clearly stated that 'cost-effective no/low regrest options are available for immediate local application. One example is provided. This point should be prioritized and the options that are found under this should be mentioned. The chapter itself could place more attention to the literature evidence of the barriers to implementation found for this option. Such knowledge is needed for implementation of these favoured options. [Jean-Luc Chotte, France]	More examples and quantification has been added to the ES
12491	3	2	4	15	Many of these bullet points read like a theoretical treatment of response options without mentioning them specifically. This may not be the approach that is most successful to represent chapter content or reach policy makers. A pragmatic, specific and comparative (!) journey across response options, their synergies and trade-offs may be more successful. If this would be combiend with information on the magnitude of the contribution of response options to mitigation or adaptation this would be most successful. [Hans Poertner and WGII TSU, Germany]	More examples have been added to the ES

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21255	3		4		GENERAL comment on exec summary - there is a lot of repetition in the exec summary that could be deleted. In particular 2nd sentences often repeat much of the 1st sentence - this should be avoided and these sentences deleted/merged. [, United Kingdom (of Great Britain and Northern Ireland)]	The ES has a headline statement after which details are added - this is a standard format for IPCC ES text
22733	3	1	5	23	There are multiple wording issues in particular with respect to singular and plural and adjectives (e.g. "large") which cause a high level of ambiguity, if not confusion. [Anastasios Kentarchos, Belgium]	Done
27225	3	1	5	23	Please try to be more specific in the Executive Summary whenever possible. Please add confidence statements and reformulate policy prescriptive statements (e.g., "need to be addressed", The need to act is urgent", and in particular "more R&D is required" - alleged conflict of interest) in a more scientific way (e.g., "science suggests...", "this assessment shows...", "scenarios indicate...". There is also some room for streamlining by removing duplications, e.g. regarding BECCS. [, Germany]	More examples and quantification has been added to the ES
17717	3	1	5	23	The language would need to be proof-read (there a quite a few issues with English language), and use of uncertainty language harmonised. Furthermore, use of references to chapter sections would be good to harmonise with the other chapters of the report. [, Sweden]	Done
39759	3	1	5	23	The overview could be more explicit about the options with greatest potential. Table 6.2 is not adequately captured; for example, there's no discussion of value chains or risk management in the Executive Summary. [, United States of America]	More examples have been added to the ES - though not everything can be included - it is a summary
12235	3	2	5	23	Some sentences and paragraphs of this Executive Summary sound far more prescriptive than the Executive Summaries of other Chapters of this Special Report. Pointing out for example the benefis of certain actions will be more useful for the target audience of the Executive Summaries than a statement that tells readers what needs to be done or is necessary. [Hans Poertner and WGII TSU, Germany]	Other reveiwers are asking for more specifics
29217	3	2	5	23	Overall a good ES, but the more quantifications and clearer statment would further improve the ES. [Jan Fuglestvedt, Norway]	More examples and quantification has been added to the ES
40783	3		5	45	More substance in the ES would be appreciated, eg lessons learnt from case studies, regional hotspots… Examples of un sunstainable land management (e.g. biofuels, palm oil crops on peatland) and potential implications? [Valerie Masson-Delmotte, France]	We are assessing 42 response options across 6 land based challenges so have an enormous amount of ground to cover - not all of the 252 pairwise interactions can be included in the ES - but we have now included more information on the spatial limitations
7333	3		5		The issue of gender needs to be emphasised more strongly in the ES [Debra Roberts, South Africa]	Text on gender added
28441	3	1	174	35	General: This simplistic assessment evaluates each of the response options in turn with respect to each of the challenges in turn. It makes very little effort to address linkages and integration of response options, despite the title. Its evaluation of each option does not adequately reflect the breadth of relevant literature, and does not adequately explain and discuss the underlying processes. While it is desirable to present visual summaries, in general these issues are too complex to synthesise with simple coloured arrows; this style of presentation fails to convey the wide ranges and uncertainties of estimates. With respect to the individual challenges and responses, other chapters - esp 7 and 4 - do a better job of presenting an overview of the relevant literature and explaining the nuances of the issues. Perhaps text could be moved, or relevant sections cross-referenced. [Barron Joseph Orr, Germany]	We have to manage many more intercations in Chapter 6 than other chapters, which can pick pairwise interactions and discuss in detail. We have addressed this issue by better cross-referencing to other chapters

Comment No	From Page	From Line	To Page	To Line	Comment	Response
28443	3	1	174	35	General: The chapter should focus on the opportunities and limitations in integrating the various measures, at different spatial scales from farm - watershed - region - nation: guidance on how can integration be done, what tools can assist integrated landscape planning and management, what policies can support integration. Which response options are most compatible and likely to be synergistic. [Barron Joseph Orr, Germany]	Tools and policies are dealt with in Chapter 7
28445	3	1	174	35	General: The chapter is inconsistent in treatment of land-based challenges. In section 6.2 other challenges are described as in the following sections and the final assessment (which logically follow the chapter structure of the report). Furthermore, in the intro the provisioning of ES/NCPs is mentioned but it is not treated similar to the other land challenges but rather at the end of the chapter seperately. While acknowledging that NCPs are multiple which does not fit the simple coding of the other land challenges it would be good to integrated this in a single treatment of the options. Also the other land challenges can be decomposed: food security also has multiple dimentions (nutrition, quantity etc.) [Barron Joseph Orr, Germany]	All of the response options can be decomposed into many sub-categories - but we already cover 42 options (40 in the FD). Going to the next level of granularity would lead to many 100s of options and would be impossible to synthesise in a way that would be useful for policy makers, so we have declined to make this change - instead we have provided more nuance in the 40 reponse options we do cover (see new tables in section 6.3)
28447	3	1	174	35	General: The option descriptions in the text and the descriptions of tradeoffs is full of subjective language ('largest potential'/ 'likely to be very small') and other phrases that are not well balanced between the options and not grounded in the debate in the literature. Most is based on the level of implementation of these options in the Integrated Assessment Models rather than on underlying science on these options and literature on the large tradeoffs is ignored. At many places the preference of the authors is visible in relation to their own background. Careful editing of the text is needed to provide more objective and broader evidence for some of these statements. [Barron Joseph Orr, Germany]	Perhaps the reviewer missed section 6.4 which is entirely quantitative - see tables in that section. All language is calibrated against the quantitative thersholds given in that section.
28449	3	1	174	35	General: The options listed in this chapter form the basis of what policy makers might be able to extract from this report. While considerable progress has been made, we feel the list of options is neither comprehensive nor organized in a way that can be actionable. A number of options seem to be missing while the logic of their categorization seems to have overlaps as well as gaps. We feel this needs to be reviewed and reworked. [Barron Joseph Orr, Germany]	A clear definition of which reponse options are included and which are frameworks of collections of interventions. The designation is not perfect - but has been transparently described in a new table (6.3)
28451	3	1	174	35	General: Some response options are so vague and broad that it is hard to see how they fit your definition of response option - especially EbA and increased productivity. Why include these while climate smart ag is excluded? [Barron Joseph Orr, Germany]	A clear definition of which reponse options are included and which are frameworks of collections of interventions. The designation is not perfect - but has been transparently described in a new table (6.3)

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9935	3	1	174	35	The UNCCD SPI reviewers consider that this chapter 6 should focus on the opportunities and limitations in integrating the various options, at different spatial scales from farm - watershed - region - nation: guidance on how can integration be done, what tools can assist integrated landscape planning and management, what policies can support integration. Which response options are most compatible and likely to be synergistic. The executive summary is careful in not mentioning response options that have much larger potential benefit than others. This is laudable as the uncertainty on effect sizes is very high. Nevertheless, it is exactly this information on the benefit of individual response options that is needed to make proper investments and identify those options that are 'fiddling in the margin'. Table 6.5 to 6.18 nevertheless attempt such a quantification and in general even give high agreement levels to the numbers. However, these numbers may be extremely misleading and are not comparable. Some apply to implementing a response option to all agricultural land currently available while others only to areas where there is high potential. There is large unclarity on these differences in underlying assumptions. The dietary change option potential is highly underestimated as it is only a conversion to 'healthy' diets and not more extreme options like vegetarian or vegan diets. While for some of the physical measure like application of rock to have increased weathering very far reaching (and incredibly nonrealistic assumptions are made). One option is to delete these tables from the chapter as they are not comparable. This is not the preferred option as a comparison is extremely important and exactly the contribution this report could make. It would be useful to document the range of estimates in the literature with the assumptions on the level of implementation of the option. There is a lot of literature on the important options, i.e. the range of benefits from 'nationally recommended diets' to 'full vegan' diets would help explain the potential of such an option and, at the same time, give an indication of what would be needed to reach such a benefit. Same for increased organic matter content, here a range based on different measures could be given across the feasible to full agricultural area to give a more detailed indication. Also, numbers per ha and per person of the measures would be important as it makes it more easy to really compare the measures. Such an analysis will also better reveal the knowledge gaps and could make the executive summary more specific and avoid investment in those measures where little benefits (and potentially large tradeoffs) are expected. Moreover, there are many instances where uncertainty statements declare "robust evidence" and "high agreement", yet only one study is cited. Even if the cited study is a recent meta-analysis, more supporting evidence is required for such a strong conclusion. While we are asked to overlook editorial errors, it is disturbing to see so	We have added more examples to the ES to emphasise the most promising options
9941	3	1	174	35	General: This simplistic assessment evaluates each of the response options in turn with respect to each of the challenges in turn. It makes very little effort to address linkages and integration of response options, despite the title. Its evaluation of each option does not adequately reflect the breadth of relevant literature, and does not adequately explain and discuss the underlying processes. While it is desirable to present visual summaries, in general these issues are too complex to synthesise with simple coloured arrows; this style of presentation fails to convey the wide ranges and uncertainties of estimates. With respect to the individual challenges and responses, other chapters - esp 7 and 4 - do a better job of presenting an overview of the relevant literature and explaining the nuances of the issues. Perhaps text could be moved, or relevant sections cross-referenced. [Jean-Luc Chotte, France]	We have to manage many more interations in Chapter 6 than other chapters, which can pick pairwise interactions and discuss in detail. We have addressed this issue by better cross-referencing to other chapters
9943	3	1	174	35	General: The chapter should focus on the opportunities and limitations in integrating the various measures, at different spatial scales from farm - watershed - region - nation: guidance on how can integration be done, what tools can assist integrated landscape planning and management, what policies can support integration. Which response options are most compatible and likely to be synergistic. [Jean-Luc Chotte, France]	Tools and policies are dealt with in Chapter 7

Comment No	From Page	From Line	To Page	To Line	Comment	Response
9945	3	1	174	35	General: The chapter is inconsistent in treatment of land-based challenges. In section 6.2 other challenges are described as in the following sections and the final assessment (which logically follow the chapter structure of the report). Furthermore, in the intro the provisioning of ES/NCPs is mentioned but it is not treated similar to the other land challenges but rather at the end of the chapter seperately. While acknowledging that NCPs are multiple which does not fit the simple coding of the other land challenges it would be good to integrated this in a single treatment of the options. Also the other land challenges can be decomposed: food security also has multiple dimentions (nutrition, quantity etc.) [Jean-Luc Chotte, France]	All of the response options can be decomposed into many sub-categories - but we already cover 42 options (40 in the FD). Going to the next level of granularity would lead to many 100s of options and would be impossible to synthesise in a way that would be useful for policy makers, so we have declined to make this change - instead we have provided more nuance in the 40 reponse options we do cover (see new tables in section 6.3)
9947	3	1	174	35	General: The option descriptions in the text and the descriptions of tradeoffs is full of subjective language ('largest potential'/ 'likely to be very small') and other phrases that are not well balanced between the options and not grounded in the debate in the literature. Most is based on the level of implementation of these options in the Integrated Assessment Models rather than on underlying science on these options and literature on the large tradeoffs is ignored. At many places the preference of the authors is visible in relation to their own background. Careful editing of the text is needed to provide more objective and broader evidence for some of these statements. [Jean-Luc Chotte, France]	Perhaps the reviewer missed section 6.4 which is entirely quantitative - see tables in that section. All language is calibrated against the quantitative thersholds given in that section.
9951	3	1	174	35	General: There are many instances where uncertainty statements declare "robust evidence" and "high agreement", yet only one study is cited. Even if the cited study is a recent meta-analysis, more supporting evidence is required for such a strong conclusion [Jean-Luc Chotte, France]	Uncertainty language has been revisted throughout
9953	3	1	174	35	General: It is hard to understand why multiple partially, and in some cases completely, overlapping options are included. This makes interpretation of total potential impossible, and is potentially misinterpreted by readers. The caveat that they are not additive must be included in every figure, so that these figures are not used out of context. [Jean-Luc Chotte, France]	All of the response options can be decomposed into many sub-categories - but we already cover 42 options (40 in the FD). Going to the next level of granularity would lead to many 100s of options and would be impossible to synthesise in a way that would be useful for policy makers, so we have declined to make this change - instead we have provided more nuance in the 40 reponse options we do cover (see new tables in section 6.3)
9955	3	1	174	35	General: Some response options are so vague and broad that it is hard to see how they fit your definition of response option - especially EbA and increased productivity. Why include these while climate smart ag is excluded? [Jean-Luc Chotte, France]	A clear definition of which reponse options are included and which are frameworks of collections of interventions. The designation is not perfect - but has been transparently described ina new table (6.3). Eba is a framework and has been moved there.
9957	3	1	174	35	General: There appears to be limited attempt to review the abundant literature on this topic, with heavy reliance on a few studies, especially those by the authors. This is a particular problem when these studies are limited in depth and/or breadth, and when they present a biased view, ignoring literature that presents opposing evidence and perspectives. [Jean-Luc Chotte, France]	This is not supported by the evidence - there are 68 pages of references - we have consulted a very wide literature
9959	3	1	174	35	General: While we are asked to overlook editorial errors, it is disturbing to see so many typos, incorrect words, missing words, poorly formulated sentences, and errors in the reference list. [Jean-Luc Chotte, France]	Not very constructive - but all corrected for the final draft
12489	3	2		13	The text is missing out on mentioning biodiversity impacts as one of the core issues affected by response options and associated tradeoffs? [Hans Poertner and WGII TSU, Germany]	Added
12487	3	2			This bullet jumps into the chapter content right away without introductory sentence defining what a response option actually is. [Hans Poertner and WGII TSU, Germany]	Defined in gloassary - but also now explained here

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7395	3	11			Reads wrongly, should say "...for example response options that demand land for climate mitigation, if implemented at scale, could cause adverse side effects for food production and thereby food security". [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Wording changed
5189	4	1	4	1	Specific examples of " 'no regrets' or 'low regrets' options for wider implementation" are desirably indicated. [, Japan]	More examples and more quantification has been added to the ES
21257	4	1	4	1	Can examples be given here? [, United Kingdom (of Great Britain and Northern Ireland)]	More examples and more quantification has been added to the ES
39767	4	4	4	4	Text reads: "... considerable scope for wider deployment globally." What does "considerable scope" mean? Biophysical? Economic? With existing infrastructure? Theoretical or practical? With what level of and type of investment and what consequences for communities, for example? [, United States of America]	Clarified
9979	4	6	4	7	BECCS addresses the climate challenge; how is this a land challenge? It seems that you are classing climate change as a land challenge. Explain and justify this counterintuitive stance. [Jean-Luc Chotte, France]	Land challenges defined in the glossary and now earlier in the ES
7147	4	6	4	15	There seems to be an overlap between the contents here and those on page 3 lines 14-22. [Debra Roberts, South Africa]	Removed
5191	4	6	4	15	"Some response options, such as large-scale BECCS, have the potential to deliver very well for one land challenge only, with potential detrimental effects on other land challenges" may be unclear for readers. We would suggest revising, for example, to "Some response options, such as large-scale BECCS, have the potential to deliver very well for one land challenge, mitigation only, with potential detrimental effects on other land challenges". [, Japan]	Reworded
22749	4	7	4	7	BECCS is one of the few options specifically mentioned. This is good as BECCS is central in many mitigation scenarios. However, BECCS is mentioned as having the 'potential to deliver very well'. Further in the chapter the fact that BECCS is never applied at large scale and has many unknowns at a technological level are mentioned. Therefore suggestion to rephrase 'have very large potential' to 'are in scenario studies assumed to have very large potential' or similar to correctly reflect the uncertainty. [Anastasios Kentarchos, Belgium]	Reworded
9973	4	7	4	7	BECCS is one of the few options specifically mentioned. This is good as BECCS is central in many mitigation scenarios. However, BECCS is mentioned as having the 'potential to deliver very well'. Further in the chapter the fact that BECCS is never applied at large scale and has many unknowns at a technological level are mentioned. Therefore suggestion to rephrase 'have very large potential' to 'are in scenario studies assumed to have very large potential' or similar to correctly reflect the uncertainty. [Jean-Luc Chotte, France]	Reworded
7389	4	8	4	27	This is in the right direction given the above two comments, but it needs to be built into the dominant conclusions, not expressed as an afterthought or caveate as in so many previous reports. Polcy-makers will simply gloss over this section and will instead focus on the big numbers they might achieve with BECCS and forestry if only they try hard enough. Again, emmbrace the cautionary literature in the primary conclusions. [Stephen Pacala, United States of America]	Reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39769	4	11	4	12	The discrete focus on land challenges and lack of assessing indirect effects appears to be limiting the consideration of other potential ways that food security challenges could be addressed if land-use change response options are pursued, which they likely will need to be to reach mitigation targets. For example, safety net programs, market mechanisms, addressing food waste, or alternative distribution pathways, etc., could also address food security challenges. While discussed more in other chapters, without some inclusion in the impact assessment here, the results could be misleading. [, United States of America]	We are assessing 42 response options across 6 land based challenges so have an enormous amount of ground to cover - not all of the 252 pairwise interactions can be included in the ES - but we have now included more information on the spatial limitations
22751	4	12	4	15	under the options mentioned also dietary change (and all other options that reduce demand such as decreasing food waste) should be mentioned as these also have the potential to decrease competition for land (very directly) [Anastasios Kentarchos, Belgium]	Added
21547	4	12	4	15	I feel this sentence is out of place in this para - it's clearer if it focuses on BECCS (and to some extent, large-scale afforestation) only, rather than mentioning solutions that don't belong in this category of single-purpose mitigations. [Andy Reisinger, New Zealand]	Reworded
15197	4	12	4	15	Rebound effects appear to be ignored here. There is substantial literature demonstrating that, in the absence of effective governance constraints, improving production efficiencies leads to increasing investment in expansion of production area. [Daniel Zarin, United States of America]	Rebound effects discussed in the chapter
39771	4	12	4	15	Text reads: "Options that improve land management or improve efficiency of production of food and fibre (sustainable land management options) do not fall into this category and they either do not affect competition for land, or have the potential to decrease it (robust evidence; high agreement) {Section 6.5}." This is hard to believe and reflects more a common dialog than a strong reading of the literature. While intensification can reduce pressure on land-use change and carbon losses to the atmosphere, it also can increase profitability and motivation to clear land faster, increasing carbon emissions. There is a clear need for appropriate governance (which also means capacity for governance) if intensification is in fact going to reduce land-use change while increasing productivity. Without that governance in place, intensification very likely leads to extensification of agriculture. There is a meaningful literature on this topic, and an IPCC report should distill and reflect that understanding. This point is sufficiently central and sufficiently misunderstood (as it is in the current text here) that it should also be considered as a highlight in the SPM. [, United States of America]	This rebound effect has been added in the chapter
9975	4	12	4	15	under the options mentioned also dietary change (and all other options that reduce demand such as decreasing food waste) should be mentioned as these also have the potential to decrease competition for land (very directly) [Jean-Luc Chotte, France]	Added
39773	4	16	4	17	This text pointing out that there are barriers to response options needs to appear earlier and not be so disconnected from all the response options. Else readers can easily get the wrong impression. [, United States of America]	Added
21549	4	16	4	27	I feel this para needs a bit more detail on the nature of the barriers, otherwise it doesn't actually say very much (or invites decision-makers to doubt the actual existence of the solutions - if they are not taken up and if you can't tell them what the reasons are, it's hard to invest resources to overcome those barriers). [Andy Reisinger, New Zealand]	Reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39775	4	21	4	23	While yes there is high agreement that multiple barriers exist that need to be assessed and overcome, there is no mention of how trade-off analyses are also needed to assess where investments will be more fruitful, given some barriers (e.g., cultural, instability) may be insurmountable. [, United States of America]	This has now been added to section 6.5
39777	4	22	4	23	This text assumes the barrriers can in fact be overcome. At least acknowledge that not all barriers can be overcome. It would be better to explain what the literature says about which can and which can't. And in some cases it would likely be easier to overcome barriers to solutions that aren't even included or considered here (like, on the demand side, diet change, e.g., by continuing to improve the texture and flavor of plant-based alternatives to beef) than overcoming some of the barriers on the production side. By omitting these alternative solutions (perhaps indirect but only slightly so), the text leaves the reader with the impression that alternative solutions do not even exist, and there is no evidence to suggest that is the case -- quite the contrary. [, United States of America]	This has now been added to section 6.5
15199	4	24	4	25	It's unclear why policy options that would create ecosystem service markets are not included here. [Daniel Zarin, United States of America]	Policy is dealt with in Chapter 7
21551	4	25	4	25	I feel the reference to financial aid here is far too narrow; replace with "the creation of incentives and financial resources". It doesn't have to be 'aid' as there are other mechanisms, and more importantly, you need policies that actual incentivise the protection of those non-monetary values. [Andy Reisinger, New Zealand]	Sentence referring to financial aid has been removed
26189	4	25	4	25	Replace "aid" with "incentives" [Reid Detchon, United States of America]	Sentence referring to financial aid has been removed
7149	4	28	4	29	What does the coordinated action seeks to achieve? Consider adding this component to the headline statement. [Debra Roberts, South Africa]	Wording changed
39779	4	28	4	32	It's not just the diversity of types of barriers. Even within a type (e.g., institutional), there's a need for coordination. [, United States of America]	Wording changed
21553	4	28	4	36	This para is largely tautological (lines 33-36 mostly repeat the substance of lines 28-32), and the bold sentence is too short: action is required to achieve what? More work needed on this one. [Andy Reisinger, New Zealand]	Wording changed
7151	4	30	4	30	Consider adding 'of response options' after 'implementation'. [Debra Roberts, South Africa]	Wording changed
7153	4	33	4	33	Consider adding 'of response options' after 'implementation'. [Debra Roberts, South Africa]	Wording changed
22753	4	34	4	34	action were coordinated amongst' is not sufficiently clear: what type of action is imagined here that fits all these categories of actors that are mentioned?. If not specified this is a meaningless phrase. [Anastasios Kentarchos, Belgium]	There is a new section 6.5.4.3 discussing the different roles of stakeholders in land management; details are not provided here because it is an Executive Summary
9977	4	34	4	34	action were coordinated amongst' is not sufficiently clear: what type of action is imagined here that fits all these categories of actors that are mentioned?. If not specified this is a meaningless phrase. [Jean-Luc Chotte, France]	There is a new section 6.5.4.3 discussing the different roles of stakeholders in land management; details are not provided here because it is an Executive Summary
39781	4	37	4	37	"The need to act is urgent." For how long has the science community been saying this? It is true, of course, but it would be helpful to point out when the science community first identified this need as urgent and that the need has only gotten more extreme in subsequent years. [, United States of America]	Reworded
29219	4	37	4	37	Re the sttament "The need to act is urgent": As this is written now it is too general and policy prescriptive. I suggest you relate this to a goal (e.g. teh Paris goal). Then a statement like this (reworded slightly) may work. [Jan Fuglestvedt, Norway]	Reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
12237	4	37	4	38	Can this be phrased less prescriptive and more encouraging and positive? What are the benefits of acting now? [Hans Poertner and WGII TSU, Germany]	Reworded
21555	4	37	4	45	This para could bring out more clearly the different reasons for urgency. One (and I think the most important one) is the urgency to reduce gross emissions (from sources mostly outside the scope of this report) to avoid an increasing pressure for the land to provide negative emissions; a second is that climate change impacts reduce the ability to adapt and mitigate over time; a third (not currently stated clearly) is that land-use change takes time if you want to avoid major societal disruption for those who rely on current high-emitting land uses, so a slower transition will be a more sustainable one. If the authors agree with those key points then it would be useful to have this paragraph spell them out more clearly and separately. [Andy Reisinger, New Zealand]	Reworded
2887	4	37	4	45	The urgency is not only due to biophysical irreversibilities and path dependencies but also due to irreversibilities and path dependency related to social capital, collective action, and cultural norms. [David Kaimowitz, Nicaragua]	Reworded
40781	4	37	4	45	looks prescriptive. This message in fact comes from the risk assessment (risk of high emission climate change; risk of CDR) done in ch 7… And it looks somehow prescriptive. Maybe more substance on committed warming, inertia, timescale of implementation of land changes could help. [Valerie Masson-Delmotte, France]	Reworded
22755	4	39	4	41	Change sentence as follows: "Delayed action to address any of the land challenges of climate change, desertification, land degradation and food security make them challenges more difficult to address in the future, and often make the response options less effective." Reason: These are not all "land challenges", and certainly not the only ones. [Anastasios Kentarchos, Belgium]	Good suggestion - new key message on this issue
39785	4	39	4	41	Text reads: "Delayed action to address any of the land challenges of climate change, desertification, land degradation and food security make the challenges more difficult to address in future, and often make the response options less effective." Actually, it could mean that the responses will be not only less effective but completely ineffective. Failure to limit emissions could very easily induce positive feedbacks that are beyond humans' ability to manage, eliminating the possibility of addressing impacts and drivers at all. [, United States of America]	Good suggestion - reworded
26289	4	41	4	41	should read: "to address in the future" [Aaron Smith, Norway]	Reworded
7749	4	41	4	44	Is this sentence grammatically correct? Is the second 'for example' necessary? [Hiroaki Kondo, Japan]	Reworded
39787	4	42	4	44	Text reads: "For this reason, and the extent of the land challenges currently, the need to act is urgent (robust evidence; high agreement) {Section 6.5}." Reference to the long period over which the science community has been making this point is badly needed. [, United States of America]	Reworded
14281	4	43	4	44	Vegetation response to climate change is highly uncertain and likely highly variable across ecosystems and regions. It should not be characterised as robust evidence, high agreement. E.g. Currently co2 fertilisation contributes to a substantial land carbon sink. How this will continue into the future is not well understood. Nor are future changes in precipitation well predicted, which will also affect NPP spatial distribution. [Lukas Van Zwieten, Australia]	Reworded
25581	4	46	4	47	This message is very policy-relevant and should be kept as it is ! [, France]	See exactly the opposite comment on the same sentence in comment 39789. We have retained the wording

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39789	4	46	4	48	The text should be more specific. The text is really very disappointing. [, United States of America]	See exactly the opposite comment on the same sentence in comment 25581. We have retained the wording
29385	4	47	4	47	Re "… enough is known to take action now…": As this is written now it is policy prescriptive and should be changed. [Jan Fuglestvedt, Norway]	See exactly the opposite comment on the same sentence in comment 25581. We have retained the wording
39783	4	37	5	16	Emphasis that the need to act is both urgent and needed at a scale that will achieve the targets set out in the Paris Agreement seems relevant here. Given the urgency, there may also need to be a discussion about when policymakers would need to move beyond no-regret options and how to address the trade-offs adequately. If not treated fully in this section then at least introduced. [, United States of America]	Reworded
12493	4	16			With more specifc introduction of response options the discussion of barriers would be more meaningful and allow a comparative treatment. [Hans Poertner and WGII TSU, Germany]	See section 6.3 - there are 42 response options so they cannot all be listed in the ES
32873	4	25			mention that markets also may be completely inappropriate, not merely well developed. They might not be developed at all because the market is the wrong approach to preserve ecosystem services and biodiversity. [Doreen Stabinsky, United States of America]	Sentence referring to markets has been removed
6957	4	28			A very interesting question re: the different 'actors' would be: which actors can make a difference in which area? And what exactly can (and can't) each actor do? E.g. biochar: who does what? The farmer, the industrialist, the government… or agroforestry: the farmer has to decide what to do on their farm, nobody else can make that decision, the farmer needs information, capacity, finances, etc. which can be provided by - who exactly, the government can provide incentives, investors can invest in that technology, who manages and develops the technology itself? This would probably go beyond the scope of where this chapter is at currently, but perhaps a need for a carefully mapped out 'options action plan' could be discussed? Or to create a transformation in diet, exactly what actions/interventions/investments are needed by which sector/level of government/individual? [Debra Roberts, South Africa]	There is a new section 6.5.4.3 discussing the different roles of stakeholders in land management, but these questions in general are better dealt with in Ch 7.
7397	4	31			Typo: "a multiple actors" [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Corrected
39791	5	2	5	6	A better framing would be: here are many for which the evidence base and experience are so wide and deep that implementation at scale now would carry little risk. In other cases the risks are bigger because knowledge gaps are bigger, but those risks still need to be weighed against the risk of limiting implementation of those options in the near-term. In other words, no-regrets is a good place to start but we only have so much land and we will not be able to avoid trade-offs. The need to reduce emissions and their impacts to avoid devastating impacts on human civilization is so great that we will need to accept some undesirable consequences of land-use decisions in the near-term if we are to avoid much greater impacts in the medium-to-long term. The opportunity is to identify those impacts and to put in place complementary policies that support those people who are affected. [, United States of America]	Nice rewording - this has been adopted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39793	5	7	5	7	The reference to no-regrets options begs the question: What is the high-regret option? Seems like it is probably doing anything less than the maximum possible to reduce emissions as rapidly and deeply as possible. See the IPCC 1.5°C Special Report, for example; many solid critiques suggest that it underplays the dangers. If this report in its final form gives the impression that looking only at "no-regrets options" (i.e., options that cause no problems for anyone in the short term) is consistent with what the science demands to avoid severe consequences, then it is not accurately reflecting the status of the science. [, United States of America]	Potential high regret options are already discussed and included in the ES
22757	5	10	5	10	include: Many 'no regrets' response options …..(eg. Improved dietary health through improved diets; reduced urban heat island effect, improved air quality and human health through increased urban green spaces, biodiversity protection and restoration) [Anastasios Kentarchos, Belgium]	More examples and more quantification has been added to the ES
21557	5	13	5	13	Again here the reference to barriers is too generic, and the "IF" they can be removed may in some cases be a rather large IF. More detail on the barriers and the confidence that you have that they can realistically be removed would make this para overall much more powerful because it would connect better with decision-making reality - do I really think a certain barrier is possible to be addressed, do I want to spend my political capital on something that may not actually move very much? [Andy Reisinger, New Zealand]	The fact that some barriers might not be able to be removed is now acknowledged
39795	5	17	5	17	While pointing out that some options exist that have few downsides in the short-, medium-, or long-term is a good way to start, it should not occur in isolation, even within a single key point. It needs to be tightly coupled with the point that trade-offs are needed but that it is possible to put in place safeguards for those people who would be negatively affected by those options that involve trade-offs. So you can still get to a situation where there are no big losers; it just requires an extra step. [, United States of America]	Timescale caveats added
21559	5	17	5	23	This para is too generic - yes enabling environments are important, but what do they look like? What are the issues now, what can be done, how, why would this make a difference (create a more enabling environment), and how feasible/realistic is such a change based on past experience? Some examples or more specificity would help lift this conclusion from currently almost trivial to operationally useful. [Andy Reisinger, New Zealand]	More examples are now provided in the ES
12497	5	2		4	This is an important perspective but lacks a statement on the specificity of the response option concerned. If included in terms of the nature and capacity of the response option the message would be so much stronger. [Hans Poertner and WGII TSU, Germany]	Reworded
12499	5	7		23	Enhanced specificity would support the messaging of these bullet points. [Hans Poertner and WGII TSU, Germany]	Reworded
22759	6	5	6	5	include: …reported impacts on biodiversity and ecosystems and Nature's Contribution to People [Anastasios Kentarchos, Belgium]	Cross chapter box on NCP has been moved to Ch 6 - provides an explanation
25583	6	5	6	5	It should be explicitly noted that this concept comes from the IPBES community. [, France]	Cross chapter box on NCP has been moved to Ch 6 - provides an explanation
1927	6	5	6	5	Nature's Contributions to People sounds vague. Could the authors expand on the concept? [William Lahoz, Norway]	Cross chapter box on NCP has been moved to Ch 6 - provides an explanation
39797	6	6	6	7	"... few adverse side effects ..." There is a large body of research that suggests this approach is too timid and points to an overly-narrow set of policy options. Beginning with (and identifying) approaches that have few adverse side effects is a good idea; ending there is not. [, United States of America]	Reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22761	6	16	6	16	include …,and their impacts on biodiversity and ecosystems, on NCPs ... [Anastasios Kentarchos, Belgium]	Reworded
7751	6	17	6	17	(6.5)-->(Section 6.5) [Hiroaki Kondo, Japan]	Done
7753	6	19	6	19	(6.5)-->(Section 6.5) [Hiroaki Kondo, Japan]	Done
39799	6	19	6	21	Needs additional commentary on the approach and its limitations. [, United States of America]	Done
22763	6	29	6	29	include: … to prevent desertifiatcion and land degradation, to contribute to conserve and restore biodiversity and to enhance food security [Anastasios Kentarchos, Belgium]	Sentence was removed (it was a repeat of 6.2.1 first sentence, which does mention biodiversity (NCPs))
9981	6	32	6	36	Provide more reference to support the statement that there are many such databases. You refer to one DSS including database compiled by one group in a project that has finished. Provide other examples or include "e.g.". Incllude direct reference to WOCAT : https://qcat.wocat.net/en/wocat/ [Jean-Luc Chotte, France]	Sentence modified to discuss 3 databases with web addresses provided`
39801	6	34	6	35	Maps need to be bigger to be legible. [, United States of America]	Done
39803	6	37	6	38	Good point. But not all literature focuses at the household level. Point to some of the most insightful literature on institutional barriers and what is required to overcome them (e.g., what type of capacity development for governance and/or reduced corruption; what types/levels of resources are required and how long it typically has taken). [, United States of America]	Chapter 7 has a discussion of institutional barriers, which we do not want to duplicate in Ch 6. Cross referencing added.
1929	6	38	6	38	In footnote a, should be “governance”. [William Lahoz, Norway]	OK
40785	6		6		"guidance" seems prescriptive. [Valerie Masson-Delmotte, France]	OK - removed
1705	6		9		Under the sustainable management of forests, I would recommend to mention about the non timber forest product as the one of co-element of the sustainable management of forest management. Many food cultures around the world are still based on the non-timber forest products; Perticularaly the traditional societies, (In India - Dalith and Georgia people in Eastern part). The land degredation can be managed by the intergrating the local knowledge on non-timber production system under the forest management. Reference Chamberlain, J. L., Hammett, A. L., & Araman, P. A. (2001). Non-timber forest products in sustainable forest management. In Proceedings, Southern Forest Science Conference. 10 pp.. & Mahapatra, A., & Mitchell, C. P. (1997). Sustainable development of non-timber forest products: implication for forest management in India. Forest Ecology and Management, 94(1-3), 15-29. [Sisira Withanachchi, Germany]	Literature consulted in the appropriate chapter section - not appropriate for the ES
27229	6	12			"Since we aim to assess and provide guidance on integrative response options" - It is outside the mandate of the IPCC to provide guidance, please reformulate. [, Germany]	Reworded
3673	6	36			add space in reference [Cordula Ott, Switzerland]	OK
7755	7	1	7	1	2018)-->2018). :missing period [Hiroaki Kondo, Japan]	OK
32601	7	3	7	14	I acknowledge that the chapter uses the SES framework. There is however something missing. In the figure the internal and external drivers of change of the system are mixed. Ostrom's framework for instance differentiates among internal drivers of change (specific for instance of a given ecosystem, such as erosion or land tenure) and the external ones (such as climate change in the ecological, or population dynamics of the region. Not sure this comment helps but I find important at least to clarify with you [Marta Guadalupe Rivera-Ferre, Spain]	Figure 6.1 has been redrawn and a new caption added to adress these concerns.
7757	7	5	7	5	contexts)(Brunson..)-->contexts (Brunson..): ')' should be removed. [Hiroaki Kondo, Japan]	OK

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39805	7	12	7	13	The SES example seems out of place and unexpectedly specific. Point is made without diagram, and may be better made without it. [, United States of America]	Figure 6.1 has been redrawn and a new caption added to adress these concerns.
30547	7	12	7	13	The figure on SES is somehwhat economistic and environmental in its focus. The model suffers from certain gaps: the external elements "climate", "market" and "legal framework" and "Policy" exclude other externalities or third party interests and interventions that impinge on these systems in many parts of the world e.g. illegal resource users, poachers, rustlers, land traffickers, paramilitaries, armed groups etc. Other than the abbreviation 'knowledge', traditional and local knowledge also appear to be missing from this SES model. It is assumed the word 'rules' under "Social System" also covers customary law (?). The graphic also does not explicity include 'local food system' within the social system? Social organisation, marriage and kinship also appear to be missing? [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	Figure 6.1 has been redrawn and a new caption added to adress these concerns.
9983	7	12	7	14	Fig 6.1 Albedo and dust are shown as influencing climate but C fluxes and non-CO2 GHGs are not mentioned [Jean-Luc Chotte, France]	Figure 6.1 has been redrawn and a new caption added to adress these concerns.
5395	7	15	7	24	There is an important approach towards the analysis of socio-ecological systems which is completely missing here, i.e. the social metabolism approach, see e.g. Ayres, R.U., Simonis, U.E., 1994. Industrial Metabolism: Restructuring for Sustainable Development. United Nations University Press, Tokyo, New York, Paris., Fischer-Kowalski, M., 1998. Society's Metabolism: The Intellectual History of Materials Flow Analysis, Part I, 1860– 1970. Journal of Industrial Ecology 2, 107–136. https://doi.org/10.1162/jiec.1998.2.4.107, Schaffartzik, A., et al., 2014. The global metabolic transition: Regional patterns and trends of global material flows, 1950–2010. Global Environmental Change 26, 87–97. https://doi.org/10.1016/j.gloenvcha.2014.03.013 and many more. This approach has also been applied to land-system science, e.g. Haberl, H., 2015. Competition for land: A sociometabolic perspective. Ecological Economics 119, 424–431. https://doi.org/10.1016/j.ecolecon.2014.10.002; Haberl, H., et al. 2004. Progress towards sustainability? What the conceptual framework of material and energy flow accounting (MEFA) can offer. Land Use Policy 21, 199–213. https://doi.org/16/j.landusepol.2003.10.013, Erb, K.-H., 2012. How a socio-ecological metabolism approach can help to advance our understanding of changes in land-use intensity. Ecological Economics 76, 8–14. https://doi.org/10.1016/j.ecolecon.2012.02.005 A comprehensive account of the current state of the art can be found here: Haberl, H., et al., eds, 2016. Social Ecology, Society-Nature Relations across Time and Space. Springer. I am not asking for all those to be cited, but I think this approach should somehow be represented here as well. [Helmut Haberl, Austria]	Metabolic flows are not the same as SES - we have decided that this is our prefered report approach. Ch 7 does address some of these metabolic flows approaches as they have more specific focus on global policies.
39807	7	19	7	20	Text asserts securing land tenure can decrease deforestation. It can also increase deforestation. The outcome entirely depends on context. This is one of many examples in this report where the text seems to reflect a cursory look at the literature rather than a thoughful review and synthesis. It is really very disappointing and actually unacceptable for an IPCC report. [, United States of America]	This sentence says "can" - it does not say always. It is merely used as an example of interactions between response options, not as a prescription. We had an entire section on land tenure later that provides the caveats the commentor is looking for. This section/section is not a review of land tenure literature.
7759	7	20	7	20	)(-->; [Hiroaki Kondo, Japan]	OK
40787	7		7		SES to be introduced in chapter 1, I think (also used in other chapters). What is the relevance of Fig 6.1? [Valerie Masson-Delmotte, France]	SES are now mentioned in Ch 1, and Figure 6.1 has been redrawn and a new caption added to adress these concerns.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3293	7		7		Figure 6.1 caption could include more explanation to aid reader understanding of it as there is a lot going on. Even simply including a description of what the boxes are, the arrows etc. E.g. Large coloured moxes are different sub systems that make up the socio-ecological system. Arrows indicate the interaction (?) between the system and smaller boxes are specific elements of the sub-systems? [Viola Heinrich, United Kingdom (of Great Britain and Northern Ireland)]	Figure 6.1 has been redrawn and a new caption added to adress these concerns.
7399	7	13			Fig 6.1 is an excellent description of an SES and good in general I think to see more illustrations and tables in this version to break up the text. [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Figure 6.1 has been redrawn and a new caption added to adress these concerns.
15201	7				Within the figure, I do not understand why GHG fluxes to/from the climate box are not included [Daniel Zarin, United States of America]	Figure 6.1 has been redrawn and a new caption added to adress these concerns.
5675	8	4	8	6	is it right?" land degradation are always mediated through … with a lack of agreement"? [Sanaz Moghim, Iran]	Wording clarified
5677	8	6	8	9	needs to be re-written [Sanaz Moghim, Iran]	No specifics provided
1697	8	17	8	20	Instead of seemingly '' 'no-brainers' to implement'', sometimes there might be unforeseen effects of management, underestimated or not yet well understood/assessed by researchers. Depending on the practice used, increasing soil carbon might for example in certain cases increase the occurence of weeds, pests and diseases (see chapter 4 of PhD thesis 'on the role of soil organic matter for crop production in European arable farming', link: http://edepot.wur.nl/421022), or more costly than expected [Renske Hijbeek, Netherlands]	Yes, point taken and sentence wording revised
25585	8	35	8	35	Some elements should be added about indigenous peoples and local communities, as an aspect of enablig conditions. [, France]	These issues are covered more systemtically in Ch 7
7761	8	36	8	37	Too many 'and' [Hiroaki Kondo, Japan]	OK - word choice replaced
39809	8	1	15	5	This entire section at the beginning of the chapter has some important material and ideas but overall is filled with jargon, uses multiple words or sentences where one would do, and is generally so difficult to penetrate that most readers could easily never get past the first few pages. The author team needs to take a hard look at this section and express their points in plain English. [, United States of America]	This section has been rewritten somewhat and some key concepts moved to ch 1.
7401	8	19			Is the term "no-brainer" commonly taught to non-native English speakers around the world? Or should it be replaced by a more recognisable English word? [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	OK - word choice replaced
30587	9	5	9	10	Interesting references pertaining to co-production and trans-disciplinary approaches in relation to land issues:31. Zscheischler J, Rogga S, Busse M: The Adoption and Implementation of Transdisciplinary Research in the Field of Land-Use Science—A Comparative Case Study. Sustainability 2017, 9:1926. Zscheischler J, Rogga S, Lange A: The success of transdisciplinary research for sustainable land use: individual perceptions and assessments. Sustain Sci 2018, 13:1061–1074. Hickey G, Richards T, Sheehy J: Co-production from proposal to paper. Nature 2018, 562:29. [Albrecht Ehrensperger, Switzerland]	OK thanks
6211	9	22	9	37	This section is important and might improve with a link to chpter 7's section that deals with this in more depth. [Margot Hurlbert, Canada]	OK, these links are now noted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30549	9	25	9	28	The text here would do well to recognise that the marginalisation and disregard for traditional and local knolwedge in land use plans and public policy interventions is often due to racial discrimination and prejudice (see, for example, Rodriguez, I. and Inturias, M. L. (2018) Conflict transformation in indigenous' peoples territories: doing environmental justice with a 'decolonial turn', in Development Studies Research 5 (1) (2018): 90-105; See also Brattland, C and Mustonen T (2018) "How Traditional Knowledge Comes to Matter in Atlantic Salmon Governance in Norway and Finland" Arctic 71(4)(2018) https:/ / doi. org/ 10. 14430/ arctic475 [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	Yes, true, covered more systematically in ch 7
7763	9	38	9	38	Too many 'and' [Hiroaki Kondo, Japan]	Reworded
25737	9	38	9	40	Componentes sociales en la transicion energetica.Genero en el analisis y la accion climaticos.MARIA ELINA ESTEBANEZ (UBA-CONICET.Argentina).November 27, 2018. FARN-Climate Transparency. [Roque Pedace, Argentina]	Not peer reviewed literature
2889	9	38	9	48	Discrimination against women in access to land is a particularly important constraint. [David Kaimowitz, Nicaragua]	Yes, true, covered more systematically in ch 7
32605	9	38	9	48	adding here intersectionality? [Marta Guadalupe Rivera-Ferre, Spain]	Yes, true, covered more systematically in ch 7
27231	9	5			"Lack of connection between science and practice" should please be included in the executive summary please. [, Germany]	Not a key issue for chapter so not in ES, but still in chapter
10353	10	1	10	1	"Sustainable intensification" is not defined here or the glossary, but it needs to be. It involves the use of improved systems of land use and soil management options to enhance use efficiency of inputs and reducing losses of water and nutrients with the goal of "producing more from less". [Jean-Luc Chotte, France]	It is now
7765	10	1	10	2	)(-->; [Hiroaki Kondo, Japan]	Corrected
32603	10	3	10	3	there is one extra "that" [Marta Guadalupe Rivera-Ferre, Spain]	OK
22765	10	3	10	9	Theis section (ending with "…Ostrom 2004).") should be lifted in the SPM KEYMESSAGES [Anastasios Kentarchos, Belgium]	OK thanks
23509	10	3	10	25	People are willing to come together to provide mutual assistance and protection, prevent risks, manage natural resources, and work together to find solutions to environmental supply problems. Some of the activities that belong to such collective action may include establishing institutions or rules; coordinating resources by limiting certain activities and encouraging others; sharing information to improve public goods; or mobilizing resources, such as capital, to solve collective problems. How to measure the efficiency of individuals in the collective, collective action will have a free rider phenomenon, how to avoid or eliminate this phenomenon? [Huai Jianjun, China]	Yes, true, covered more systematically in ch 7
23591	10	3	10	25	People are willing to come together to provide mutual assistance and protection, prevent risks, manage natural resources, and work together to find solutions to environmental supply problems. Some of the activities that belong to such collective action may include establishing institutions or rules; coordinating resources by limiting certain activities and encouraging others; sharing information to improve public goods; or mobilizing resources, such as capital, to solve collective problems. How to measure the efficiency of individuals in the collective, collective action will have a free rider phenomenon, how to avoid or eliminate this phenomenon? [Huai Jianjun, China]	Yes, true, covered more systematically in ch 7

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30553	10	3	10	43	Again, the evidence summarised here is partial and incomplete: the approach treats 'systems' as operating in isolation of external factors. Collective action and local systems for land governance and natural resource management are being displaced (often forcibly) by the expansion of industrial and corporate food and farming systems. The same local systems of sustainable land management and food security are being marginalised by global food and trade policies, which favour large-scale industrail farming over local autonomus food systems. See for example Pimbert, M (2018) “Food Sovereignty and the Regeneration of Terraced Landscapes” Annales, Ser. hist. sociol., 28(4)(2018):779-794; See also Clapp J (2018) "Mega-mergers on the Menu: corporate concentration and the politics of sustainability in the global food system" Global Environmental Politics 18(2)(2018):12-33 [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	External factors are covered but will be emphasized more.
7767	10	9	10	9	(Agrawal(2001)-->Agrawal(2001): '(' should be removed. [Hiroaki Kondo, Japan]	OK
7769	10	22	10	22	(Dietz et al.,(2003)-->Dietz et al.,(2003): '(' should be removed. [Hiroaki Kondo, Japan]	OK
7771	10	38	10	38	'(('-->'(' [Hiroaki Kondo, Japan]	OK
27233	10	13			Please define "social capital". [, Germany]	OK
6213	11	1	11	1	It is not vclear what is meant by 'governance frameworks'. This should be defined or perhaps reduced to just 'governance' and linked to the definition in chapter 7 [Margot Hurlbert, Canada]	OK - covered more systemtically in Ch 7
7773	11	10	11	10	2016)-->2016).: Add period. [Hiroaki Kondo, Japan]	Done
3485	11	10	11	12	The conclusion of this paragraph is only obtained from the research with respect to Uganda, it thus cannot be expanded to all developing countries. Particularly, China has carried out some effective policies to reverse land degradation (e.g., grain for green or the conversion of cropland to forests and grasslands program, GFGP). Korea and China are introduced as typical cases of reforestation success of degraded land in Chapter 4 (4.11.3). Therefore, this conclusion needs to be modified. It is suggested to add “some” before “developing countries”. [Jianqi Sun, China]	OK statement is qualified.
32607	11	13	11	23	good point highlighting power dynamics [Marta Guadalupe Rivera-Ferre, Spain]	Thanks
27237	11	22	11	25	What is considered as REDD+ project? Please see also our comments on the Entire Reports regarding the assessment of REDD+ throughout the report and regarding the definition in the glossary and revise this paragraph accordingly. [, Germany]	REDD is now included in the glossary for clarification purposes
30551	11	22	11	25	The analysis in this section should not only note concerns about REDD project interventions, but document evidence of harmful and top-down interventions that have already taken place, and have not applied the core standard of free, prior and informed consent (FPIC) plus failed to understand local systems of land use and community forest management. See for example Ecea M, Murombedzib J and Ribot J (2017) “Disempowering Democracy: Local Representation in Community and Carbon Forestry in Africa” Conservation and Society 15(4)(2017): 357-370 [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	Noted in REDD section
6089	11	23	11	23	REDD+ (Add "+") [, Poland]	OK

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22767	11	23	11	25	This sentence has been phrased very positivily towards decentralisation in forest management following one citation. There are, however, multiple examples where privatization of forest management has disastrous impacts leading to forest loss and therefore this statement is far to generic and at least the context dependence need be mentioned. [Anastasios Kentarchos, Belgium]	These caveats have been noted, and the land tenure material has now moved to ch 7
9985	11	23	11	25	This sentence has been phrased very positively towards decentralisation in forest management following one citation. There are, however, multiple examples where privatization of forest management has disastrous impacts leading to forest loss and therefore this statement is far to generic and at least the context dependence need be mentioned. [Jean-Luc Chotte, France]	These caveats have been noted, and the land tenure material has now moved to ch 7
15637	11	31	11	31	From where the term "wildland" has invented? natural ecosystem, or pristine land would be improvement in terminology I think. [Tuomo Kalliokoski, Finland]	The wildland term is used by Ellis, E. C. and N. Ramankutty. 2008. "Putting people in the map: anthropogenic biomes of the world." Frontiers in Ecology and the Environment 6(8):439-447 doi:10.1890/070062. It includes barren land, wild forests and sparse trees. In the revised text, we distinguish between barren land and wild forests and sparse trees. Therefore, we avoid using the 'wildland' term
7403	11	5			I don't think the abbreviation SLM has been described [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	SLM stands for Sustainable Land Management, this abbreviation is now explicited in this section when first using it.
27235	11	10			Please remove "unfortunately" as this is normative language. [, Germany]	Done
21259	12	7	12	8	Are anthromes a widely accepted concept within the literature? I just searched WebOfScience for "anthrome" and "anthromes" and got just a small number of results. In light of the lengthy nature of the report, could you perhaps consider removing this section. It isn't totally clear what it adds to the text [, United Kingdom (of Great Britain and Northern Ireland)]	The concept of anthromes has been used in several published papers since the original publication by Ellis and Ramankutty in 2008 and papers using this concept have been used more than 1,000 times in the scientific literature. It is now clarified that this allows to define broad land use categories which distribution across world regions is useful when assessing interlinked land challenges.
12245	12	10	12	11	Here you define wildlands as without evidence of human occupation or land use, but below in figures you term these as wildlands and inhabited eg Fig 6.2 and 6.4. Could you include inhabited land here but keep the information that 22% of ice free land is wildland or adjust figure if the 22% also includes inhabited land [Hans Poertner and WGII TSU, Germany]	The wording "inhabited land" was confusing and has been removed from the text and figures in this section. For clarification, the category wildland (i.e. not habited) was separated based on Ellis and Ramankutty 2008 into barren land and in to the category 'Wild forest and sparse trees'.
12247	12	11	12	11	Please give an estimate of the size of ice free land in km2 or other suitable metric [Hans Poertner and WGII TSU, Germany]	This estimate (134 million square kilometers) is now provided in the revised version
7775	12	11	12	11	)(-->; [Hiroaki Kondo, Japan]	This symbol was corrected
9987	12	19	12	19	The use of NDVI-change as an indicator of land degradation is debated (needs to be phrased more carefully, more references) [Jean-Luc Chotte, France]	Since the use of NDVI-change as indicator of land degradation is debated especially for very sparse and for very dense vegetation, another proxy of land degradation is now used for the purpose of the spatial analysis of interlinked challenges. This proxy is the risk of soil erosion based on the study by Borrelli et al. (Nature Communications, 2017 DOI: 10.1038/s41467-017-02142-). Limits to this proxy are carefully addressed in the text.
22771	12	19	12	21	The use of NDVI-change as an indicator of land degradation is debated (needs to be phrased more carefully, more references) [Anastasios Kentarchos, Belgium]	Since the use of NDVI-change as indicator of land degradation is debated especially for very sparse and for very dense vegetation, another proxy of land degradation is now used for the purpose of the spatial analysis of interlinked challenges. This proxy is the risk of soil erosion based on the study by Borrelli et al. (Nature Communications, 2017 DOI: 10.1038/s41467-017-02142-)Limits to this proxy are carefully addressed in the text.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21261	12	22	12	24	This comment also applies to the use of this data in Fig 6.2 C. The choice of time period (up to 2070) is an odd one - it appears to come from the underlying paper being referred to (Netzel and Stepinski). However, temperature change is generally framed in terms of 2100 in climate science and policy. It is confusing to use an alternate period. Moreover, the data looks odd as represented in Fig6.2 C (and in the underlying paper). For example, it shows Australia as experiencing little to no future climate change. Is this realistic and credible? If you look at the summary figure from AR5 (synthesis report - page 61), Australia sees significant warming, as do other regions highlighted in 6.2 C as having little to no warming. Therefore - a) please revisit the figure to present results up to 2100 and b) check that the data presented is robust [, United Kingdom (of Great Britain and Northern Ireland)]	This analysis is based on the dissimilarity between end of century and current conditions for monthly temperature and precipitation. A threshold was used to show high dissimilarity concerning this criterion, since rapid changes in seasonal temperature and precipitation conditions create a high challenge for the adaptation of land management. The interpretation of this indicator has been clarified in the revised text version. It is now specified in the text that world regions not shown as hot-spots for this indicator are nevertheless subjected to warming and reference to Chapter 2 is provided for further details.
12239	12	22	12	24	Please specify the variables for local climate - is this based on temperature, precipitation or a mixture? [Hans Poertner and WGII TSU, Germany]	This analysis is based on the dissimilarity between end of century and current conditions for monthly temperature and precipitation. A threshold was used to show high dissimilarity concerning this criterion, since rapid changes in seasonal temperature and precipitation conditions create a high challenge for the adaptation of land management. The interpretation of this indicator has been clarified in the revised text version. It is now specified in the text that world regions not shown as hot-spots for this indicator are nevertheless subjected to climate change (e.g. temperature increase) as shown in Chapter 2.
12241	12	28	12	31	Specify this analysis is for vascular plants and vertebrates [Hans Poertner and WGII TSU, Germany]	This indicator is based on vascular plant species in areas exposed to large losses of original primary habitats. These hotspots were shown to host a large fraction of all endemic plant species, and also of vertebrates (including threatened mammals and birds) and of threatened amphibians (Mittermeier et al., 2011 see full reference in Chapter).
5679	12	28	12	31	Finally what is an indicator of biodiversity? [Sanaz Moghim, Iran]	In order to show interlinked challenges, the indicator for biodiversity is based on regions with high endemic species diversity exposed to habitat loss. This indicator shows the hot-spots of high endemic species diversity across world regions. The text clarifies that there are other dimensions to biodiversity.
5681	12	32	12	34	"over recharge above one"! Should be adjusted! [Sanaz Moghim, Iran]	The text has been adjusted correspondingly
22773	12	34	12	34	Figure 6,2 Maps from 2008. perhaps there are more recent maps ? [Anastasios Kentarchos, Belgium]	The indicators used have been updated for instance the land degradation indicator (based on soil erosions) is now taken from a recently published paper (Borelli et al., 2017)
12763	12	35	12	35	Figure 6.2 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	The layout will be modified to provide a better quality of the picture
15639	12	36	12	36	Figure 6.2. Poor terminology if needed to put Wildland and Inhabited under the same label. If used only in one study then it could be questioned should it be used in this report. [Tuomo Kalliokoski, Finland]	For clarification, the category wildland (i.e. not habited) was separated based on Ellis and Ramankutty 2008 into barren land and in to the category 'Wild forest and sparse trees'. The inappropriate use of the wording inhabited has been removed.
23465	12	36	12	37	These biomes are too broad for science or policy purposes. Better to consider the 72 farming system types (and maps) of FAO/World Bank referred to above. See Dixon et al 2001 for 6 developing regions, or Dixon et al 2019 for Africa [John Dixon, Australia]	The intention with these maps is to show the distribution of the interlinked challenges for land and relate these to major land use types that cover not only agricultural uses but also other uses (e.g. forests). The use of a small number of land use categories (i.e. anthromes) allows to relate challenges and land use categories.
12243	12	37	12	37	Specify ice-free land shown [Hans Poertner and WGII TSU, Germany]	This is specified in the revised text

Comment No	From Page	From Line	To Page	To Line	Comment	Response
40793	12		12		Anthromes also used in other ch. To be introduced in ch 1. Check coherency of assessment with ch 2 (changes in local climate, novel climate conditions), aridity trends. I need to be able to understand the rationale behind the small changes indicated in panel b. For which scenario this is calculated between 2000 and 2070, and with which method? Is the single study cited here supported by others on the methodology (dissimilarity index)? Also, ch 4 says that it is not possble to have a map of current land degradation, which seems to contradict panel B. The figure 6.2 thus combines different perspectives looking at different time periods, this should be more explicit. [Valerie Masson-Delmotte, France]	The anthrome concept is being introduced in Chapter 1 and is related to land based challenges in this spatial analysis section. For land degradation, after checking with Chapter 4, we provide an indicator which is restricted to one of the dimensions of land degradation, i.e. soil erosion. Concerning the time period, the challenges shown are related to the current status of the land. However, to convey regional hotspots for climate change adaptation we refer to the dissimilarity in monthly conditions of temperature and precipitation between end of century and current conditions.
5193	12	34	13	4	Suggest modifying the title and legend of map C in Figure 6.2 to "Speed of climate change" due to avoid misunderstanding. [, Japan]	The text has been modified to avoid the wording "rapid" climate change and restrict the interpretation to the dissimilarity in monthly conditions of temperature and precipitation between end of century and current conditions
28603	12	35	13	10	should the wildlands be uninhabited, rather than inhabited? [Alan Di Vittorio, United States of America]	This inappropriate wording has now been avoided
9991	12	37	13	1	"wildland and inhabited lands (including primary forests and barren)" is a strange category. "inhabited" conflicts with the text description of wildlands as having "no evidence of human occupation" (p12 line 10). Is it supposed to say uninhabited?? Central Australia is shown as rangeland whereas the Sahel is shown as wildland, yet these regions have similar level of occupation and impact of human land use. "And inhabited land" gives the impression that other categories are not inhabited. Does it mean inhabited wildland? [Jean-Luc Chotte, France]	The use of the wording 'inhabited' was inappropriate is now avoided. Moreover, for further clarification the maps now show barren lands, as well as wild forests and sparse trees which are distinct from rangelands. In this way, these land use categories have been clarified.
39811	12	7	14	28	One example of jargon is the word "anthrome." There is no problem pointing out what this word means and to its appearance in the research literature, but it should be possible to describe the relevant points in most of the text in plain English. [, United States of America]	For avoiding jargon, the wording anthrome was not used systematically but only in the methods section in the revised section. The wording 'land use categories' was used for better communicating this notion in the text.
27239	12	16	15	5	Figures 6.2, 6.3, 6.4 and 6.5: While the condensed presentation of information might be useful to get an overview, the presentation seems oversimplified and not consistent with the IPCC's quality standards to the information provided. If this cannot be amended, we'd rather suggest deletion. - Please provide ranges, uncertainties and confidence statements. - What does „climate change“ mean? Long-term changes in meteorological parameters or climate change impacts? - Which scenario is used for 2070? - How is „hot-spot“ defined? - What is a "land challenge in Fig 6.5? - The captions should please provide further details on the data and colour scales shown in the maps. [, Germany]	These figures are intended to provide an overview and spatial analysis of the interlinked land based challenges. The figures and the corresponding text were improved in the revised version of the chapter to further clarify the methods used, the indicators for each challenge and their interpretation. For climate change, it was clarified that the indicator shows the dissimilarity between end of century and current conditions for monthly temperature and precipitation. Numerical thresholds used to define hot-spots are now fully explained when describing methods used. Moreover, the indicators used for land degradation and desertification were changed to ensure full consitency with the corresponding chapters. To gain space one figure was deleted.
22769	12	16	18	54	The land-based challenges mentioned on this page and the following pages do not correspond to the land-based challenges mentioned later in the chapter that follow the categories of table 6.2. This is very inconsistent and confusing. To achieve consistency, section 6.2 should use the same categories, to the extent possible, as in table 6.2 and all the following assessment of synergies and tradeoffs. When relying on sources addressing different "challenges", the presentation and terminology should clearly indicate the differences and connections. [Anastasios Kentarchos, Belgium]	The land-based challenges used in this section were revised to fit those in the rest of the chapter (i.e. climate change (adaptation and mitigation), desertification, land degradation and food security). In addition, the spatial analysis was extended to 3 other important land based challenges: biodiversity and water (over-abstratction of ground water and water quality) that are also discussed under the ecoystem services section in this chapter. Moreover, the same categories were used in Table 6.2 and in following discussions of synergies and tradeoffs.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8311	12	19	21		The study cited is based on linear trends. The observed trends in NDVI are strongly non-linear, where type of relationship varies per biom! Should refer to another study with better analysis, e.g. Schut et al. . Also, the metric used (annuals sums) of NDVI should be discussed as other metrics will produce different outcomes, but choices for a metric are arbitrary. The use of linear trends has been scritinized in literature, see e.g. comments on the study of Bai et al. (Bai, Z. G., D. L. Dent, L. Olsson and M. E. Schaepman (2008). "Proxy global assessment of land degradation." Soil Use and Management 24(3): 223-234.; Dent, D. L., Z. Bai, M. Schaepman and L. Olsson (2009). "Response to Wessels: Comments on 'Proxy global assessment of land degradation'." Soil Use and Management 25(1): 93-97). In later work, Schut et al (2015) used a segmented trend analysis for a longer time period (1981-2010) and a more robust dataset (GIMMS3g, also derived from NOAA-AVHRR sensors), evidently showing that most trends observed were non-linear and very different between regions/biomes. Secondly, in most regions rainfall is not the mian limiting factor and correcting for rainfall is dangerous as temperature, CO2 concentrations and nutrient availability has changed as well and may hev influenced observed trends more than rainfall in many regions. [Antonius Schut, Netherlands]	Since the use of NDVI-change as indicator of land degradation is debated especially for very sparse and for very dense vegetation, another proxy of land degradation is now used for the purpose of the spatial analysis of interlinked challenges. This proxy is the risk of soil erosion based on the study by Borrelli et al. (Nature Communications, 2017 DOI: 10.1038/s41467-017-02142-)Limits to this proxy are carefully addressed in the text.
8313	12	19	21		A reference to Schut et al. (2015) may help to add some nuance to the maps: the patterns shown are not representative of various maps in literature. Schut, A. G., E. Ivits, J. G. Conijn, B. Ten Brink and R. Fensholt (2015). "Trends in Global Vegetation Activity and Climatic Drivers Indicate a Decoupled Response to Climate Change." PLoS One 10(10): e0138013. [Antonius Schut, Netherlands]	Since the use of NDVI-change as indicator of land degradation is debated especially for very sparse and for very dense vegetation, another proxy of land degradation is now used for the purpose of the spatial analysis of interlinked challenges. This proxy is the risk of soil erosion based on the study by Borrelli et al. (Nature Communications, 2017 DOI: 10.1038/s41467-017-02142-)Limits to this proxy are carefully addressed in the text.
9989	12	1	174	35	The land-based challenges mentioned on this page and the following pages do not correspond to the land-based challenges mentioned later in the chapter that follow the categories of table 6.2. This is very inconsistent and confusing. To achieve consistency section 6.2 should use the same categories as in table 6.2 and all the following assessment of synergies and tradeoffs. [Jean-Luc Chotte, France]	The land-based challenges used in this section were revised to fit those in the rest of the chapter: i.e. climate change (adaptation and mitigation), desertification, land degradation and food security. In addition, the spatial analysis was extended to other important land based challenges: biodiversity and water (over-abstratction of ground water and water quality).
7405	12	36			Will Fig.6.1 caption be included separately? If included in the text, it is better not being split over 2 pages [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	The layout of the caption has been improved
7013	12				Fig 6.2: - In F the two shades of blue cannot be distinguished in the map. Can this be displayed in a full page landscape layout? [Debra Roberts, South Africa]	The layout will be changed and color tones adjusted in the final figure
9993	13	1	13	20	Note the caveat in Le et al, that NDVI trends is not a good indicator of degradation in sparse vegetation, so the assessment of central Australia - an area of sparse vegetation - as degraded is questionable. [Jean-Luc Chotte, France]	The indicator for land degradation has been changed given these limitations. We are now using an indicator of soil erosion, which is one dimension of land degradation.
12251	13	5	13	7	This table is not easy to understand ie how do the numbers add up. It would help to have a sentance in the caption specifying that anthromes are exposed to multiple, overlapping challenges. (to clarify for the reader that the % can exceed 100) [Hans Poertner and WGII TSU, Germany]	The revised text now specifies that anthromes are exposed to multiple overlapping challenges.
12253	13	5	13	7	I also suggest including the area size (eg km2) as well as % of ice free land area. [Hans Poertner and WGII TSU, Germany]	The area size in km2 is now provided in the caption of the table. To facilitate reading the % of ice free land area is used when breaking down this area by anthrome

Comment No	From Page	From Line	To Page	To Line	Comment	Response
12255	13	5	13	7	Add a column for area not exposed to any of these challenges [Hans Poertner and WGII TSU, Germany]	Later in the Chapter (see Figure 6.7a in revised version), the number of challenges is shown, including land areas which are not exposed to any of the challenges hot-spots.
21263	13	11	13	11	The statement about rapid climate change affecting 70% of the land on the face of it seems odd. Presumably it is based on Netzel & Stepinski. However, as noted above, the presentation of this data in Fig6.2 C seems, on the face of it, to have some strange implications (e.g. minimal Australian warming). The clear message from AR5 was that everywhere faces rapid climate change, but some regions (e.g. the Arctic) will face even more. Please consider revising to reflect this point. [, United Kingdom (of Great Britain and Northern Ireland)]	The text has been changed to better specify the interpretation of this indicator and the wording 'rapid' was avoided. We now better specify the scope of the indicator which concerns the changes (dissimilarity) in monthly temperature and precipitation conditions.
25739	13	14	13	15	“Water overuse constrains irrigation”: this problem could be overcome by desalinization of sea /brackish water and management improvements in cropland and villages. Food security can be addressed by dietary change and increase in seafood production.” [Roque Pedace, Argentina]	Indeed, such response options to interlinked challenges are addressed in following sections of this Chapter.
15641	13	17	13	17	Figure 6.3. I'm not able to understand how areas of rapid climate change have been derived, e.g. whole Finland is under rapid change while Norway and Sweden do not face this. What are the processes creating this difference? [Tuomo Kalliokoski, Finland]	The word 'rapid' climate change has been avoided. The maps show the dissimilarity in montly temperature and precipitation conditions between end of century and current conditions. The text has been revised to indicate that warming will occur under climate change scenarios on all land areas and reference to chapter 2 has been made.
12249	13	17	13	20	Specify ice-free land shown [Hans Poertner and WGII TSU, Germany]	This is now specified
40795	13		13		Table and Figure : please convey an assessment of confidence / uncertainty. [Valerie Masson-Delmotte, France]	The use of assessment of confidence and uncertainty is used in the chapter executive summary and in sections below.
8315	13	16	20		Them maps showing "degrated lands" should be discussed in depth with sufficient nuance. There may be land degradation processes active but these lands are surely not degrated, many are still in pristine conditions. These simply result from a negative linear trend in NDVI but that is not land degradation, but can be due to biome shifts, land use change deforrestation, all affecting NDVI strongly but are not signs of degradation, at best indicator iof increased risk of degradation. See discussion in Schut et al. (2015).. [Antonius Schut, Netherlands]	Given these limitations in NDVI based indicators, we now have changed the map to use one dimension of land degradation: soil erosion. We also separated in the revised version barren lands since these are not used.
29411	13	19	20		Degraded land exposed to food insecurity sounds strange to me (land itself doesn't eat food)- how about Degraded land overlapping with food insecurity? [Bojana Bajzelj, United Kingdom (of Great Britain and Northern Ireland)]	This sentence has been revised to better explain the spatial overlap between land challenges
39813	14	1	14	6	This is an example of a place where the text talks about land degradation but it is not at all clear how degraded lands have been defined. [, United States of America]	The indicator of land degradation has been changed and we now use soil erosion, one dimension of land degradation. Moreover, barren lands were distinguished to avoid potential misinterpretation.
7777	14	5	14	5	Figure 6. --> Figure 6.3 [Hiroaki Kondo, Japan]	This has been specified in revised version
3295	14	5	14	5	Figure 6.) --> what Figure? 6.4? 6.5? [Viola Heinrich, United Kingdom (of Great Britain and Northern Ireland)]	This has been specified in revised version
7779	14	7	14	10	The order of explanation for each anthrome in the text should be in accordance with the order of each panel in Fig.6.4. [Hiroaki Kondo, Japan]	This has been corrected and consistency is now ensured
7781	14	15	14	15	The area with red color is not clear in each panel of Fig.6.4 at all. Bigger figure should be better. [Hiroaki Kondo, Japan]	The graphical layout of the figure has been improved
7783	14	16	14	22	It is not clear the difference between red area and other colored area except for grey area. Is the area with threatened biodiversity hotspots included in red area or not? [Hiroaki Kondo, Japan]	The graphical layout of the figure has been improved
12257	14	23	14	23	What is meant by number of land based challenges? combinations of the 5 challenges specified above? [Hans Poertner and WGII TSU, Germany]	This means combinations of overlapping challenges. This is now better explained in the text

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39815	14	23	14	28	Have the authors addressed the distribution with respect to national income/capacity generally and adaptive capacity specifically? [, United States of America]	The distribution of the number of challenges with respect to the human development index is addressed in Figure 6.7, which includes national Gross domestic product per capita (i.e. income)
12259	15	1	15	1	Could this information be displayed as a table? This would be easier to understand and read the numbers. [Hans Poertner and WGII TSU, Germany]	The figure has been changed into a bar graph to make it easier to read the values
40799	15		18		evidence, agreement / these case studies? Conclusions => key findings => ES? [Valerie Masson-Delmotte, France]	These case studies show how responses have been used historically for interlinked challenges. They allow to explain how human dimensions are connected with natural dimensions and prepare for next sections which provide generalization
3675	15	11			reconsider title: Case studies on anthropogenic Biomes? [Cordula Ott, Switzerland]	We have used in the title of the box the wording anthrome as it has already been defined above.
39817	16	1	16	54	The section on pasture intensification needs to be stronger. At line 30, be more specific. Identify the drivers and the main actors. The text implies that smallholders need to cut forest for their livelihoods, but are smallholders the main driver of deforestation in Indonesia? Most literature would suggest that industry drives this land-use change. Smallholders may be involved, but not as primary agents. Certainly policies could be structured that would support smallholders while also reducing land-use change/deforestation. [, United States of America]	The text in this section has been revised to answer this comment and better account for the causes and processes of deforestation.
39819	16	45	16	51	Text reads: "It is argued that RSPO still lacks information about land-clearing trajectories and of comprehensiven assessments (Gaveau et al. 2016)." The analysis needs to be much more pointed; no student of deforestation in Indonesia thinks that the effectiveness of the RSPO rests purely or mainly on information. Certification of supply chains is indeed a much-discussed policy option and should receive attention here. But this is an IPCC report and should go much further beneath the surface to explore situations where certification seems to have worked, and what is known and unknown about its effectiveness in meeting different objectives. [, United States of America]	Additional references were added to further discuss this issue and the role of certification of supply chains
9995	16	49	16	49	As this is about Indonesia, and you refer to Kalimantan below, this should also say Kalimantan rather than Borneo, to avoid confusing the reader. [Jean-Luc Chotte, France]	We now used Kalimantan only in the text
40797	16		16		reduced reforestation in Brazil : check coherency with other chapters (seach for key words "Amazon" and "Brazil"). Check updates for recent years with reversed trend. [Valerie Masson-Delmotte, France]	An additional referenc has been added allowing to mention this issue
7785	17	1	17	1	)(-->; [Hiroaki Kondo, Japan]	This is corrected
9997	17	9	17	37	Fig 6.4 does not appear to show any wildlands in Europe. The definition of wildlands as not showing any evidence of human occupation of land use is inconsistent with this description of abandoned ag land. [Jean-Luc Chotte, France]	We now separate between barren lands and wild forests and sparce trees to avoid confusions about wildlands
23905	17	41	17	45	It may be noted that the cited paper (Rao et al. 2016) is a study on global air quality, and there is no mention of drought events in India. Also the findings of the cited paper (Zhang et al. 2017) may not be representative of the country scale Indian agriculture as the study area covers the IGP region only, which contributes to about 58% of the wheat area & about 67% of the total wheat production in India in 2013-14. [, India]	Concerning Rao et al. (2016) reference, there was a mistake in the reference list which is now corrected. While the Zhang et al. Paper does not cover all regions in India, results are relevant for regions covered.
19023	17	41	17	45	It may be noted that the cited paper (Rao et al. 2016) is a study on global air quality, and there is no mention of drought events in India. Also the findings of the cited paper (Zhang et al. 2017) may not be representative of the country scale Indian agriculture as the study area covers the IGP region only, which contributes to about 58% of the wheat area & about 67% of the total wheat production in India in 2013-14. [Sanjay Jayanarayanan, India]	Concerning Rao et al. (2016) reference, there was a mistake in the reference list which is now corrected. While the Zhang et al. Paper does not cover all regions in India, results are relevant for regions covered.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
23739	17	44	17	44	2015 also witnessed a severe drought over India. Ref: Mujumdar et al. (2017): Clim Dyn (2017) 48:4081–4091, DOI 10.1007/s00382-016-3321-2 [, India]	An additional reference has been added allowing to mention this issue
1403	17	44	17	44	2015 also witnessed a severe monsoon drought over India. Ref: Mujumdar et al. (2017): Clim Dyn (2017) 48:4081–4091, DOI 10.1007/s00382-016-3321-2 [Krishnan Raghavan, India]	An additional reference has been added allowing to mention this issue
9999	18	1	18	1	"Land is scarce" is a peculiar statement; do you mean that unoccupied land is scarce? [Jean-Luc Chotte, France]	This statement has been corrected
10001	18	2	18	4	this is based on a single study of women in one area, whereas it is presented as a generic observation. reword. [Jean-Luc Chotte, France]	This has been reworded
10351	18	14	18	14	The glossary definition of "conservation agriculture" could be enhanced. It is important that this report reflects that conservation agriculture is a system-based approach involving no-till, mulch farming through surface retention of crop residue mulch , cover cropping and complex rotations, and integrated soil fertility management with judicious use of both organic and inorganic sources of plant nutrients. [Jean-Luc Chotte, France]	Conservation agriculture does integrate several practices which are used in combination. This is reflected in this regional example
5683	18	32	18	36	"reduce urban air"! What the author means by urban air! air temperature [Sanaz Moghim, Iran]	This has been corrected and consistency is now ensured
5685	18	37	18	38	"even though urban farming can only meet a very small share of the overall urban food demand" why! At least a reference! [Sanaz Moghim, Iran]	A reference has been provided
5687	18	40	18	41	"Ground-based urban farming dominates urban food production" isn't it opposite of sentence @ line 38 "even though urban farming can only meet a very small share of the overall urban food demand" [Sanaz Moghim, Iran]	This is not in contradiction. The first sentence indicates that within urban farming, the land based urban farming (by contrast with e.g. indoors production or roof-top production) share is large. However, the total contribution of urban farming to cities food consumption is small
25741	18	44	18	53	Z-farming in urban environment can be supplemented with better periurban food production and take advantage of cheap renewable electricity and improved LED lighting reducing pressure on other anthromes for food production. [Roque Pedace, Argentina]	The development of such systems is addressed
5689	18	49	18	51	"One critical aspect of urban farming is …air pollutants"! Is it right! [Sanaz Moghim, Iran]	Agreed
32609	18	51	18	53	you may want to cross-refer to chapter 5 where we touch upon the issue of urban food [Marta Guadalupe Rivera-Ferre, Spain]	Agreed
32185	18	14			Reference to salinity tolerant plants (also tolerant to heat, droughts, with increased yield or transgenic plants resistant to insects or nematodes) can be done here when referring to "improved varieties". [Francisco Javier Hurtado Albir, Germany]	Improved varieties cover a range of resistance to biotic and abiotic pests as well as increased productivity and quality
7407	18	41			The phrase 'urban farming faces soil quality constraints' needs an explanation or at least a citation [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	This issue has been better explained by adding further references
22779	19	42	18	18	The current section only mentions SSP3 and SSP4 as if these are the only scenarios with multiple challenges. This is not correct. [Anastasios Kentarchos, Belgium]	We have added the other SSPs
27241	19	1	19	2	These five challenges are different from those mentioned in chapter 1 and the SPM that mention 1. mitigation, 2. adaptation, 3. desertification, 4. land degradation and 5. food security - with "climate change" as a sixth challenge missing (please see our related comment). Please be consistent across the report. [, Germany]	We have adjusted the text to use a consistent set of challenges.
18125	19	1	19	15	SSP3 and SSP4 scenarios should be clearly separated [Vladimir Romanenkov, Russian Federation]	We have separated these.
29221	19	1	19	18	Useful section and overview. [Jan Fuglestvedt, Norway]	Thank you!
18123	19	4	19	4	Biodiversity loss is projected to increase from 34% in 2010 to 46% in 2100 [Vladimir Romanenkov, Russian Federation]	We have corrected this bullet.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10005	19	4	19	5	"without response options" Do you mean without interventions to address these five challenges? From the text below it seems you just mean without climate policy responses? [Jean-Luc Chotte, France]	We have clarified this in the text.
27245	19	7	19	7	Please add "further efforts beyond those in place today" so that the sentence would read "Absent any further efforts beyond those in place today to mitigate... ". [, Germany]	We have added "additional" to reflect this comment, but with fewer words
22775	19	7	19	15	paragraph on climate change : refer to IPCC 1,5 which includes possible pathways, such as climate resilient development pathways [Anastasios Kentarchos, Belgium]	These pathways are discussed in section 6.5 as this section focuses on scenarios without response options
27243	19	7	19	15	Climate change goes beyond long-term temperature increase. Please mention changes of climate characteristics beyond precipitation changes, e.g. various extreme events (heat waves, droughts, storms), and climate change impacts, e.g. freshwater availability or shifting vegetation zones. [, Germany]	We have added this information
21265	19	7	19	19	There is probably too great a focus on RCP8.5 given that it now appears to be looking more improbable than previously thought (e.g. only SSP5 can produce 8.5 forcing). So could you please clarify that it is a high end forcing scenario and/or add other scenarios. [, United Kingdom (of Great Britain and Northern Ireland)]	We've removed the specific mention of RCP8.5 and made the statement more general.
12261	19	7	19	40	Please also refer to lower warming scenarios - see Special Report on Global Warming of 1.5C [Hans Poertner and WGII TSU, Germany]	We've removed the specific mention of RCP8.5 and made the statement more general.
10007	19	17	19	17	increase in dryland area does not equate to land degradation. [Jean-Luc Chotte, France]	We have separated the discussion of desertification from land degradation.
10009	19	18	19	19	why are human influences on LD not assessed? The impacts on land of expected increase in human population and average per capita demand for meat should be considered. You do mention scenarios with cropland expansion in relation to biodiversity loss, so why not in relation to land degradation? Are you saying that the scenario literature you reviewed does not consider land degradation? [Jean-Luc Chotte, France]	We have added additional information on human influences on land degradation.
12525	19	26	19	27	Please specify the taxonomic groups in these studies eg vertebrates, insects etc [Hans Poertner and WGII TSU, Germany]	We have added this information.
22777	19	27	19	31	paragraph on biodiversity: revise according to IPBES regional assessements and assessment on land degradation and restoration [Anastasios Kentarchos, Belgium]	We have added information from the IPBES assessments
10011	19	32	19	32	Changes due to climate change? or also other factors? [Jean-Luc Chotte, France]	We have clarified this in the text.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25103	19	32	19	41	Water stress includes both quantity-induced and quality-induced scarcity. This knowledge needs to be clarified at the end of this paragraph. The following texts can be used. It needs to be pointed out that water stress can be induced by insufficient water supply in comparison with water demand (quantity-induced water scarcity) and by pollution that makes clean water not available. Traditionally almost all water scarcity studies focus on quantity-induced water scarcity. Since very recently years, scientists started to make first attempts to assess water scarcity by considering water quantity and water quality (Zeng et al., 2013; Liu et al., 2016). Such an approach was adopted to assess quantity-induced and quality-induced water scarcity for China (Liu et al., 2017). This Chapter still emphasizes quantity-induced water scarcity for water stress assessment. Zeng Z, Liu J., Savenije H.H.G., 2013. A simple approach to assess water scarcity integrating water quantity and quality. Ecological Indicators 34: 441-449. Liu J., Liu Q., Yang H., 2016. Assessing water scarcity by simultaneously considering environmental flow requirements, water quantity, and water quality. Ecological Indicator 60: 434-441. Liu J.*, Yang H., Gosling, S. N., Kummu, M., Flörke, M., Pfister, M., Hanasaki, N., Wada, Y., Zhang, X., Zheng, Y., Alcamo, J., Oki, T., 2017. Water scarcity assessments in the past, present, and future. Earth's Future 5: 545-559. [Junguo Liu, China]	We have added this information and one of the citations
25743	19	32	19	41	water stress can be alleviated by desalinization increasing world total intake and biomass productivity with other adaptation and mitigation cobenefits, see also comment 2 on page 13. [Roque Pedace, Argentina]	Desalination is a response option and is not included in this section as it explicitly excludes response options.
7787	19	35	19	35	2015)W-->2015; W [Hiroaki Kondo, Japan]	We have corrected this.
10003	19	42	19	42	The current section only mentions SSP3 and SSP4 as if these are the only scenarios with multiple challenges. This is not correct. [Jean-Luc Chotte, France]	We have added the other SSPs
21267	19	42	19	43	Suggest using Riahi et al 2017 as the SSP reference https://www.sciencedirect.com/science/article/pii/S0959378016300681 [, United Kingdom (of Great Britain and Northern Ireland)]	We have added the Riahi citation
12765	19	43	19	43	There is a semicolon that should not be there [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	We have removed it.
30555	19	1	20	15	This secton on land challenges does not spell out, even in brief, the associated governance, legal and policy challenges generating these harmful land impacts and creating continued negative scenarios into the future. Many of the listed land degradation and environmental 'challenges', including climate change, food insecurity and water stress are driven by unsustainable global trade and harmful and often illegal commodity production and supply chains. Industrial farming is a major driver of water scarcity and pollution affecting local land management and livelihood systems. It is recommended that this section cross reference with other sections of the IPCC report to ensure these linkages with policy, governence and legal challenges are made and are not just indirectly confined to the subsequent section at 6.3 (Response options). [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	We have noted policy and institutions as challenges contributing to challenges to mitigation and adaptation.
39821	19	1	20	18	This section is much shorter than ther others, and a key component to understanding future interlinkages. May want to give equal weight or tighten other sections. [, United States of America]	We have added some additional material

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21269	19	42	20	18	It's not clear why just SSP3 and SSP4 have been described in detail here. All of the SSPs have features that are relevant to the issues described in this chapter. Please provide a more balanced (but not lengthy) description of the SSPs, if you feel that it is useful to be describing them here. [, United Kingdom (of Great Britain and Northern Ireland)]	We have added the other SSPs
21271	19	42	20	18	SSP3 is presented here in terms of forcing and SSP4 in terms of temperature, please use consistent metrics. Additionally, please also note that these are the SSP baselines, i.e. in the absence of climate policy [, United Kingdom (of Great Britain and Northern Ireland)]	We have added the other SSPs and noted that these are baseline scenarios
21561	19	1			The information in this chapter is really useful, and I was dismayed that you could not simply cite the other chapters to provide it but had to go to the primary literarature. This isn't really this chapter's problem, but I urge the authors to put more effort into a cross-chapter scenario group that ensures that basic information about future scenarios is covered within chapters 2-5, so that chapter 6 can then draw on this and summarise, rather than provide this information from scratch. [Andy Reisinger, New Zealand]	We have added more links to the previous chapters. However, we do feel that some of this information needs to remain in this chapter for balance and to indicate confidence.
27247	19	18			Please add „direct“, because climate change is also anthropogenic. [, Germany]	This sentence has been removed in response to other comments
3677	19				information on global/regional distribution could be included in the processes discussed [Cordula Ott, Switzerland]	Agreed
28605	20	4	20	4	if biodiversity is declining, shouldn’t MSA be declining? [Alan Di Vittorio, United States of America]	Reworded
15643	20	4	20	4	You mean decrease? [Tuomo Kalliokoski, Finland]	Corrected
7789	20	8	20	8	As SSP4 is addressed after this sentence, this sentence should be normal sentence without bullet. [Hiroaki Kondo, Japan]	Corrected
22781	20	8	20	9	This is not a new bullet, should be a full sentence as a diferent scenario is introduced. [Anastasios Kentarchos, Belgium]	Corrected
10015	20	8	20	9	Should not be bullet - separate from previous list. [Jean-Luc Chotte, France]	Corrected
15645	20	10	20	10	Here temperature, erlier radiative forcing. Should be same metrics, easier to compare different SSPs. [Tuomo Kalliokoski, Finland]	We have adjusted to use temperature throughout
33037	20	16	20	18	Not quantifying biodiversity loss in the SSP4, undermines its ability to present a cohesive holisitc rel-time picture for climate change. Without biodiversity data, it is not clear how we can fall in line with the thought that 'food insecurity declines substantially in the future due to increased income (Hasegawa et al. 2015b)". Increased income cannot bring back the lost biodiversity. [Neeraja Havaligi, United States of America]	The biodiversity and food security studies are separate and should not be linked. We have expanded the discussion to include biodiversity loss under more scenarios.
6215	20	21	20	47	Risk management is an important concept and not defined in the chapter. Linkeage to chapter 7 risk management might assist with interlinking the chapters and concepts. [Margot Hurlbert, Canada]	Done with examples in section 6.3 - see new tables
22783	20	22	20	22	include: … to address the land challenges of climate change mitigation, climate change adaptation, biodiversity loss, desertification …. [Anastasios Kentarchos, Belgium]	Reworded
10017	20	27	20	27	what does "high input carbon practices" mean? [Jean-Luc Chotte, France]	Reworded
18113	20	29	20	30	Include also optimized fertilizer timing and placing [Vladimir Romanenkov, Russian Federation]	Reworded
18115	20	29	20	30	Precision application with variable rate fertiliser is not the same approach. Proper placement of fertilisers is a more universal element of technology approach which meet site-specific crop needs and limit potential losses from the field, such as strip, foliar application and depth of placement. [Vladimir Romanenkov, Russian Federation]	Reworded
10019	20	30	20	30	inhibitors of what? nitrification, perhaps? [Jean-Luc Chotte, France]	Yes - reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10021	20	34	20	35	poorly worded: IK, LK and gender issues are not enabling conditions [Jean-Luc Chotte, France]	Revised
10023	20	39	20	39	EbA is a very broad goal too! [Jean-Luc Chotte, France]	Removed and discussed as an overarching framework
10025	20	44	20	46	EbA is similarly a collection of response options [Jean-Luc Chotte, France]	Removed and discussed as an overarching framework
21563	20	21	21	12	Please state more clearly and explicitly in this section that the individual interventions are not additive but partly (and in some cases strongly) overlapping. This is stated clearly later on in another section but should be made clear very prominently here. [Andy Reisinger, New Zealand]	Statement moved up to here
909	20	19	42	7	A number of response options under categories of land management, value chain management and risk management have been included in this section. All these are useful, and provide a good choice of options for the country governments, financial organisations, private entrepreneurs and farmers to implement. However, it would have been more desirable if the options could have been further clubbed according to their potential regional utility and application, say under different 'global agro-ecological zones'. This would facilitate easier selection of response options by a country or a specific region of that country. It may require more work by the authors of this Chapter, but the effort would be worth considering. [Jagdish Kishwan, India]	This is done in section 6.5
10013	20	8			This is not a new bullet, should be a full sentence as a diferent scenario is introduced. [Jean-Luc Chotte, France]	Corrected
2487	20	19			This section "6.3 Response options, co-benefits and adverse side-effects across the land challenges", including in particular the overview in Table 6.2, is indeed very useful. However, several issues with significant relevance are not integrated: Recycling/ Recovery of nutrients (from waste water, sewage sludge, wastes, manures) has significant potential to reduce artificial fertiliser use, one key element of GHG emissions linked to food systems. Another issue is the topic of remediation of contaminated sites. More generally, circular economy approaches (including the links to reducing mining activities, GHG emissions) are not integrated in a suitable way. [Sigrid Kusch-Brandt, Germany]	These are included under other integrative response options (e.g. manure management, waste reduction etc.)
27249	20	24			Please refer also to chapter 1, figure 1.4. [, Germany]	Cross reference added
25587	21	5	21	5	It's unreadable. If this table is to be kept, the font should be greatly increased. [, France]	Done
22785	21	5	21	10	Table 6.2: include in the column on "integrative response options": - in the row on "Response options based on land management": "Protected area management" - In the row on "response options based on governance and risk management": "soil and/or land protection legislation" and "biodiversity protection legislation" [Anastasios Kentarchos, Belgium]	Policies are dealt with in Chapter 7
22787	21	5	21	10	The font of the table should be increased. [Anastasios Kentarchos, Belgium]	Done
27251	21	5	21	10	Table 6.2.: Why is SLM not mentioned and discussed but SFM is? Please add a discussion on SLM or explain in the text why not. In addition, it would be useful to add references to chapter 7 in the second line. [, Germany]	SLM is comprised of all the land based response options - described in section 6.3
5195	21	5	21	10	Please make the Table 6.2 bigger for easier reading. The information of the Table 6.2 is important for policy makers. [, Japan]	Done
5197	21	5	21	10	Suggest that in Table 6.2, it be clearly mentioned that options assessed on both global and local scales are included and that options with no crosses include not only those inappropriate to address issues but also those with no literature supporting their potential to address issues. [, Japan]	Reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5199	21	5	21	10	Suggest addition of ”Management of landslides and natural hazards” as an option available for adaptation in Table 6.2, based on subsections 6.3.1.13 (page 27 line 31-48)and 6.4.2.1 (page 49 line 7-10) and Table 6.19 (page 68 line 3-page 69 line 1). [, Japan]	Added
5201	21	5	21	10	Suggest addition of “Promotion of value-added products” as an option available to address mitigation and adaptation in the Table 6.2 based on subsections 6.3.2.4 (page 35 line 23-43) and 6.4.2.2 (page 50 line 36-39). [, Japan]	Added
10031	21	5	21	10	Table 6.2 How is "increased food productivity" a response option? It is the outcome of several response options. [Jean-Luc Chotte, France]	All reponse options are clearly defined
10033	21	5	21	10	Table 6.2 Presumably land tenure as a response means security of land tenure? [Jean-Luc Chotte, France]	Reworded
25105	21	5	21	10	It is difficult to read texts in Table 6.2 [Junguo Liu, China]	Done
30955	21	5	21	10	There is not consistency between this figure Table 6.2, SPM 4 and adaptation and mitigation options laid out in Table 6.19, which summarizes land management response options. Important adaptation measures such as ecosystem-based adaptation (see suggestion for rename to ecosystem restoration in second comment), management of invasive species are left out. [Kelsey Perlman, France]	Corrected
24129	21	5	21	10	Table 6.2: include in the column on "integrative response options": - in the row on "Response options based on land management": "Protected area management" - In the row on "response options based on governance and risk management": "soil and/or land protection legislation" and "biodiversity protection legislation" [Zoltán Rakonczay, Belgium]	Policies are dealt with in Chapter 7
34005	21	5	21	11	the response options are called integrated or integrative, this should be made consistent. And, moreimportantly, it should be specified what that means. At the moment it seems a collection of all possible climate mitigation and adaptions response options, plus some more on desertification, degradation and food security. Therefore "integrated" is not a further specification of response options, but it's just the long list of options to respond to the 5 challenges to land. In many instances, "integrated" can be left out, as you name the five challenges anyway. Integrated then is misleading, as one tends to think about a subset of the long list. [Elke Stehfest, Netherlands]	Now defined at beginning of the chapter and in the glossary. Terminology harmonised
17233	21	5	21	12	Table 6.2 suggests different response options. As for options on land management, response options should consider the following options: 1. Forest restoratio and enhancement; 2. Enhancement of ecosystem services; 3. It also suggest that pest and disease for crops and plantations are future risks in the context of climate change. Therefore option on controlling pest and disease risks should be considered to secure productivity and sustainability. [Hoang Anh Le, Vietnam]	These are included under other integrative response options (e.g. sustainable forest management) and future climate risks are discussed in Chapter 2.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30557	21	5	21	12	This tabular matrix (and hence the actual IPCC analysis and report) is missing core elments and response options. The section on options in value chain management excludes the option for trade and value chain regulation to eliminate illegal land use change, related GHG emissions, rights abuse and harm to sustainable land management systems from global supply chains. As noted elsewhere in the IPCC report, single policy interventions like voluntary commodity standards are unliely to deliver transformative change: a policy mix is required. In short, there is growing evidence and increasing public demand for statutory regulation of global supply chains to tackle imported or "embodied" deforestation, climate damage and harm to communites at the point of production. See Pimbert, M (2018) “Food Sovereignty and the Regeneration of Terraced Landscapes” Annales, Ser. hist. sociol., 28(4)(2018):779-794 at page 784. There are also options that need to be taken up to strengthen company CSR policies and systems for corporate due diligence to prevent business operations and investmants harming land, people and the climate. All of these options should be included in the IPCC report. See, for example Donofrio S, Rothrock P and Leonard J (2017) Supply Change: Tracking Corporate Commitments to Deforestation-Free Supply Chains, 2017 Forest Trends, Washington DC. Under options based on governance, there is a important need to include anticorruption measures and access to justice (effective redress) as core intervention options that are proven drivers of positive policy change in support of good land and envirommental governance - see, for example, Bebbington A J, Bebbington D H, and Sauls La (2018) Assessment and Scoping of Extractive Industry and Infrastructure in Relation to Deforestation: Global and Synthesis Report Graduate School of Geography, Clark University, Worcester MA. The option "land tenure/ownership" is very broad. It is recommended that the options list should be diaggregated and expanded to include the specific option of "Legal reforms and interventions to secure customary/community tenure". Likewise "prevention of land grabbing" is a very general option, this should be disaggreated to specific options, including "Reform of land allocation/concession frameworks", which are currently centralised, prone to corruption and often fail to identify and protect preexisting customary tenure systems and local systems for sustainable land management - see Griffiths, T (2018) Closing the Gap: rights-based solutions for tackling deforestation FPP, SRDC, SCPDA, APA, FECONAU, CRIMA, FAPI, Sesdev, Okani, Pusaka, Tuk Indonesia, Moreton in Marsh. In addtion, the list of options under governance should include a specific option for "measures to combat the direct and underlying causes of land degradation". The option to apply cross sectoral approaches is also missing from this table as is the need to reform of public and global policies for food security and national	Chapter 7 is where evaluation of commodity standards occurs. We have included supply chain standards in a new option in ch 6, but a further discussion of the governance dimensions of global supply chains is in ch 7.
1931	21	7	21	11	The font in Table 6.2 seems too small to me. I suggest authors consider an increase in font size. [William Lahoz, Norway]	Done
10027	21	9	21	9	In table 6.2 agro-forestry is not ticked under food security. There is evidence that the higher agro-diversity in agro-forestry systems leads to more diverse and better nutrition [Jean-Luc Chotte, France]	Added
22789	21	9	21	10	In table 6.2 agro-forestry is not ticked under food security. There is evidence that the higher agro-diversity in agro-forestry systems leads to more diverse and better nutrition [Anastasios Kentarchos, Belgium]	Added
32611	21	9	21	10	Table 6.2. Agroforrestry contributes to food security. Other options linked to forest can contribute to food security through non-timber forest products. Although I recogn this is context-specific [Marta Guadalupe Rivera-Ferre, Spain]	Added
18127	21	9	21	10	Table 6.2 Climate mitigation Ch1 [Vladimir Romanenkov, Russian Federation]	Cross reference added
22791	21	10	21	10	in table 6.2 'land tenure / ownership' is better phrased as 'land tenure / access' as ownership per se is not undebated and the issue in reality is access to land, see theoretical work of: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1549-0831.2003.tb00133.x [Anastasios Kentarchos, Belgium]	Removed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10029	21	10	21	10	in table 6.2 'land tenure / ownership' is better phrased as 'land tenure / access' as ownership per se is not undebated and the issue in reality is access to land, see theoretical work of: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1549-0831.2003.tb00133.x [Jean-Luc Chotte, France]	Removed
12767	21	10	21	10	The text in table 6.2 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
25651	21	13	21	13	This typology of forest activities is not consistent with those used in chapter 2 and chapter 4, for example. We suggest that an additional effort be made to strengthen consistency within the report in how different forest activities are considered, in particular by using the same typology from one chapter to another. See GENERAL COMMENT ON THE TYPOLOGY OF FOREST ACTIVITIES. [, France]	The typology of forest activities is now consistent accross chapters
39823	21	14	21	26	There are a number of response options listed here, and they need to be presented in a way that more accurately reflects the underlying literature. For example, the text reads: "Increased soil organic matter content (and reduced losses) can be achieved across a range of different land uses, including ... by addition of biochar..." It is possible that biochar increases SOM but, despite a great deal of rhetoric and even a large number of publications, the evidence is scant and the debate is very real. See for example Gurwick et al. 2013. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0075932. [, United States of America]	Reworded
18117	21	23	21	25	including optimised fertiliser and organic material application rate, type, timing and placement [Vladimir Romanenkov, Russian Federation]	Reworded
28453	21	46	22	6	While it is true that land degradation neutrality is a target -- specifically SDG target 15.3, it is also an overarching framework which was endorsed by the 197 country Parties of the UNCCD in 2017. Of those, 120 are actively setting LDN targets and developing transformative projects and programmes. LDN is predicated on the achievement of multiple benefits -- in other words, a project that does not have such ambitions cannot qualify as an LDN project. One of the indicators of LDN is soil organic carbon, and part of the reason country Parties selected this as one of a few essential variables was to ensure that addressing land degradation and the pursuit of land-based measures to mitigate climate change and build resilience in support of cclimate change adaptation could be optimized and more readily incentivized. We strongly recommend the authors review the literature on LDN and reshape this chapter to build it more fundamentally into the way response is presented. The citations are: Orr, B.J., A.L. Cowie, V.M. Castillo Sanchez, P. Chasek, N.D. Crossman, A. Erlewein, G. Louwagie, M. Maron, G.I. Metternicht, S. Minelli, A.E. Tengberg, S. Walter, and S. Welton. 2017. Scientific Conceptual Framework for Land Degradation Neutrality. A Report of the Science-Policy Interface. United Nations Convention to Combat Desertification (UNCCD), Bonn, Germany. and Cowie, A.L., B.J. Orr, V.M. Castillo Sanchez, P. Chasek, N.D. Crossman, A. Erlewein, G. Louwagie, M. Maron, G.I. Metternicht, S. Minelli, A.E. Tengberg, S. Walter, and S. Welton. 2018. Land in balance: The scientific conceptual framework for Land Degradation Neutrality. Environmental Science & Policy 79:25-35. doi: 10.1016/j.envsci.2017.10.011 and Chasek, P, M. Akhtar-Schuster, B.J. Orr, A. Luise, H. Rakoto Ratsimba and U. Safriel. 2019. Land degradation neutrality: The science-policy interface from the UNCCD to national implementation. Environmental Science & Policy 92:182-190. doi: 10.1016/j.envsci.2018.11.017 [Barron Joseph Orr, Germany]	LDN is a policy goal - not a response option - we have cross referred now more effectively to Chapter 4

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8317	21	14	26		Improved varities needs to be more specified. Typically improved varieties have less organic matter production below ground and more harvestable product, resulting in a lowering of OM. To incresed OM, one would have to cponvert back to crops will lower harvest indices.....I would not call this improved though. [Antonius Schut, Netherlands]	This is a caveat
8319	21	14	26		Addition of biochar is considered here a part of organic matter. That is not correct, it is part of the carbon in the soil, but not the same as degrading organic matter but more part of the inert part of the C pool. In functional terms, more like charged charcoal than decomposing and/or humified organic matter. [Antonius Schut, Netherlands]	Corrected
25589	21	5			Table 6,2 : This typology of forest activities is not consistent with those used in chapter 2 and chapter 4, for example. We suggest that an additional effort be made to strengthen consistency within the report in how different forest activities are considered, in particular by using the same typology from one chapter to another. See GENERAL COMMENT ON THE TYPOLOGY OF FOREST ACTIVITIES. [, France]	The typology of forest activities is now consistent accross chapters
21565	21	10			Table 6.2: why is trade not included as solution under value chain management? (I don't think "food transport and distribution" quite captures this). Also food price stability would be worthwhile listing on its own. In general, a bit more clarity is needed how those entries were derived, especially given that their overlapping nature means that some are somewhat superfluous (e.g. increased food productivity is really the sum of the interventions above that term). I have no objection to overlapping terms, but it means you should consider other overlapping terms in other categories, too. [Andy Reisinger, New Zealand]	Trade added
3679	21	13			does information also come from, rely to other main Chapter of the Report? Cross-references? Relation between the Chapters is also a general question [Cordula Ott, Switzerland]	Cross referencing improved throughout the chapter
12263	21	13			Little or no application of uncertainty language in this section, please use for key findings [Hans Poertner and WGII TSU, Germany]	This just decribes the practices - uncertainty language is used in section 6.4 where the impact is quantified
8321	22	3	3		The effect of OM on water holding capacity is rather small. Water content increases with only 2% VOL per % increase of C!! See Minasny et al (2018). Further, in many soils increasing OM doesn't add much in terms of drought resistance of crops, it is only in specific soils where OM is very critical for water hodling capacity.. [Antonius Schut, Netherlands]	partially agree. In sandy soils increasing OM is critical for increasing WHC Increases in water retention are higher in sandy soils, and less important or null in in fine-textured soils (Rawls et al. 2003)..
8323	22	3	3		Minasny, B. and A. B. McBratney (2018). "Limited effect of organic matter on soil available water capacity." European Journal of Soil Science 69(1): 39-47. [Antonius Schut, Netherlands]	accepted and included
1933	22	2	22	2	I suggest remove “so”. [William Lahoz, Norway]	Done
10039	22	6	22	6	LD includes desertification, so it is not logical to say desertification and LD as if they are distinct. Could refer ot LD in drylands (ie desertification) and non-drylands. [Jean-Luc Chotte, France]	Since desertification is addressed in a Chapter of this report it should also be addressed when discussing interlinked challenges
26291	22	7	22	7	should read: "are increased by increasing organic" [Aaron Smith, Norway]	This sentence has been revised (increasing soil organic matter)
3299	22	7	22	7	"by increasing in organic matter content" is it inorganic? Or simply 'by increasing organic matter content', slightly confusing as it stands just now [Viola Heinrich, United Kingdom (of Great Britain and Northern Ireland)]	This sentence has been revised (increasing soil organic matter)
10041	22	7	22	8	increasing SOIL organic matter [Jean-Luc Chotte, France]	This sentence has been revised (increasing soil organic matter)
21273	22	9	22	13	Cross reference Chapter 2 Section 2.7.1.1. [, United Kingdom (of Great Britain and Northern Ireland)]	Agreed
22793	22	10	22	10	Albedo impacts of conservation agriculture need to be mentioned, e.g. doi:10.1111/gcb.14362 [Anastasios Kentarchos, Belgium]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10035	22	10	22	10	Albedo impacts of conservation agriculture need to be mentioned, e.g. doi:10.1111/gcb.14362 [Jean-Luc Chotte, France]	Done
39825	22	10	22	12	Also in the vein of treating the literature in more depth, the text here reads: "... the impact of no till farming and conservation agriculture on soil carbon stocks is often positive (de Moraes Sá et al. 2017; Steinbach et al. 2006) but can be neutral or even negative (Palm et al. 2014; Powlson et al. 2014; Cheesman et al. 2016; Powlson et al. 2016; VandenBygaart 2016) ..." It is good to see the more balanced treatment of tillage, but the underlying issue -- that most studies do not sample with sufficient depth to be able to capture whole system C balance, and the generally unknown fate of lost soil C (erosion and burial? decomposition? erosion and decomposition?) -- should be identified. These points need to be placed in the larger context of the risk that "best estimates" of climate mitigation impacts for particular practices are inaccurate or even directionally incorrect. Decisions about which practices merit priority investment depend on the potential magnitude of the carbon benefit, the risk associated with achieving that benefit, as well as the suite of potential co-benefits or unintended conseqences that this chapter mainly addresses. [, United States of America]	Too much detail - we have 252 pairwise interactions to cover in the chapter
21275	22	12	22	13	Where is the evidence to support the statement 'depending on the amount of crop residues returned to the soil'? Need a reference or delete statement. [, United Kingdom (of Great Britain and Northern Ireland)]	Reworded
18119	22	14	22	15	delete one repeating ‘emissions’ [Vladimir Romanenkov, Russian Federation]	Done
10043	22	16	22	17	It would be helpful to mention that yield penalty could result from stubble retention leading to disease, allelopathic effects, cooling of soil impacting seedling germination and growth or physically retarding seedling emergence. [Jean-Luc Chotte, France]	Reworded
10045	22	22	22	23	Provide example of"integrated production system" that is different from the other practices named; provide example of biotech that is a "high input carbon practice'. [Jean-Luc Chotte, France]	accepted. For example, integrated crop-livestock, and integrates soil-crop management. Chen, X.P., Cui, Z.L., Vitousek, P.M., Cassman, K.G. [et al.]. 2011. Integrated soil–crop system management for food security. PNAS 108, 6399–6404, https://doi.org/10.1073/pnas.1101419108 Lemaire, G., Franzluebbers, A. 2014. Integrated crop–livestock systems: Strategies to achieve synergy between agricultural production and environmental quality. Agric. Ecos. Environ. 190, 4-8. https://doi.org/10.1016/j.agee.2013.08.009
18121	22	23	22	24	nutrient management: including optimised fertiliser application rate, fertiliser type (organic and mineral), timing and placing [Vladimir Romanenkov, Russian Federation]	accepted
10037	22	30	22	30	Mentioning this estimate is only useful if also the conditions/assumptions are given: implementation of what alternative management on how much of the world arable area. There are multiple studies in the literature, also on what are feasible areas, and this needs to be explained and substantiated. A bit is in Ch 2 but here the number is mentioned so also the conditions are required. [Jean-Luc Chotte, France]	not accepted. The paragraph is very general and enumerates a set of maangement practices aiming at increasing residue retruns to soil and OM increases. The second paragraph begiing in #30 provides some examples about how cobenefits may ocur.
22795	22	30	22	32	Mentioning this estimate is only useful if also the conditions/assumptions are given: implementation of what alternative management on how much of the world arable area. There are multiple studies in the lieterature, also on what are feasible areas, and this needs to be explained and substantiated. A bit is in Ch 2 but here the number is mentioned so also the conditions are required. [Anastasios Kentarchos, Belgium]	idem

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10047	22	31	22	31	(and throughout) Strictly speaking soil carbon is not a sink because sink is a process that removes CO2 from the atmosphere, and soil cannot do this other than indirectly, via sequestration in plants. It is correct to refer to mitigation by increasing soil carbon stocks, or managing grazing land or cropland or forest land as a soil carbon sink. The glossary includes the term soil carbon sequestration , which is defined as: Land management changes which increase the soil organic carbon content, resulting in a net removal of CO2 from the atmosphere. and therefore gets around the problem by referring to land management and the net removal of CO2 from the atmosphere. [Jean-Luc Chotte, France]	accepted. It was replaced by this sentence: :"... and increasing soil carbon stocks in …"
7791	22	32	22	32	(Smith 2008) Smith et al. 2014)--> Smith 2008; Smith et al. 2014) [Hiroaki Kondo, Japan]	accepted
7793	22	36	22	36	(Chapter 2: (Porter et al.2014)-->(Chapter 2; Porter et al. 2014) [Hiroaki Kondo, Japan]	Done
7795	22	37	22	37	(Chapter 3; (Bryan et al. --> (Chapter 3; Bryan et al. [Hiroaki Kondo, Japan]	Done
7797	22	39	22	39	(Chapter 4; ; (Labrière et al.-->(Chapter 4; Labrière et al. [Hiroaki Kondo, Japan]	Done
12771	22	39	22	39	There is an exceeding semicolon [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
7799	22	40	22	40	(Chapter 5; (Porter-->(Chapter 5; Porter [Hiroaki Kondo, Japan]	Done
25653	22	42	22	42	We believe herd management is a good pool of practices that can lead to mitigation, and propose to add in B5.2 of the SPM that Herd management can also be improved (decreasing birth mortality, improving sanitary conditions and health, herd renewal...) in order to decrease unproductive periods, when GHG are emitted with no outcome), and there are also some genetic responses with the choice of adapted races for the animals, and also for the species used as feed (grazing management, protein content and equilibrium of the amino acids etc.). Some of these options are present in the chapter 6 (6.3.1.3), but not all of them, 6.3.1.3 could be completed. For some solutions proposed in this paragraph to reduce emissions from enteric fermentation, there is few evidence on the long term effects on the animals and on the environment, on the costs, on the social acceptance and regulatory authorisations (for example ionophores / antibiotics, propionate enhancers, archaea inhibitors, nitrate and sulphate supplements,; microbial technology such as archaeal vaccines, methanotrophs, acetogens, defaunation of the rumen, bacteriophages and probiotics). We propose to have these practices appart from the others, and with a warning message on the possible side effects for the animals and the environment. [, France]	Now included in livestock management
10049	22	48	22	48	not clear what you are saying about methanotrophs and acetogens [Jean-Luc Chotte, France]	This sentence has been revised
32615	22	42	23	15	Improve livestock management mixing all different types of production systems is confusing. It would be interesting at least to clarify that there are many production systems, with different synergies and trade-offs and integrated response options. Reducing or increasing livestock size (number of animals), or changing breeds or species, or diversifying species, are also interesting responses. [Marta Guadalupe Rivera-Ferre, Spain]	The chapter addresses integrative response options to interlinked challenges. To allow for such an overview, the number of response options categories has to be limited. This is the reason for having a single livestock management category which encompasses several practices and their integration

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8325	22	30	31		Some nuance is needed. A sink suggests that there is a net storage of C, but this needs to be offset against effect of added N with associated N2O emissions and CO2 emission during production using fossil fuels. [Antonius Schut, Netherlands]	not accepted. Such naunce is provided in #30
32183	22	25			"Improved water management" can be enhanced by adding "and renewable (e.g. solar) or efficient water pumping" combined with irrigation. "Efficient" refers in fact to the control of the motor driving the pump. Motor control combined with pumping (for irrigation or not) is a well-known measure aiming at energy saving. [Francisco Javier Hurtado Albir, Germany]	accepted
18337	22	35			cropland management can also foster adaptation by providing local cooling effect during extreme events (Davin et al., PNAS, 2014; https://doi.org/10.1073/pnas.1317323111) [Edouard Davin, Switzerland]	accepted
14697	23	1	23	1	Figure SPM 7. Demand-side mitigations list 'Healthy diet - Limited sugar, meat and dairy'. Is there a reference to support this claim? Linking the statement to Chapter 5, p. 57 lines 17-25 would help validate this claim in the SPM. [, Canada]	This figure has been deleted
10057	23	2	23	2	specify: MANURE storage conditions [Jean-Luc Chotte, France]	Manure is mentioned
39827	23	6	23	15	Because livestock is one of a small number of principle drivers of land-based GHG emissions, this option of improved management should not be presented in isolation but in tandem with the potential magnitude of reductions from demand-side measures like dietary shifts. Particularly in developing countries, if plant-based alternatives to beef can be developed well enough for consumers to accept them as substitutes, then the trajectory of dietary change that tends to accompany economic growth could be decoupled from associated increases in emissions. The perspective of the developing world is absent from much of this report, and this is one opportunity to address that weakness as well as to highlight the relative magnitude of different options for reducing emissions associated with ruminants production -- the one with by far largest reductions being reduced consumption. [, United States of America]	Initially in this chapter suppy-side and demand side options are presented in distinct sections. However, when addressing future pathways supply and demand side options are recoupled. This opportunity of coupling reduced consumption with changes in the livestock sector is therefore addressed later, but for the sake of clarity livestock management is shown as a distinct option here.
12965	23	7	23	7	Using a different climate metric for methane would significantly increase or decrease this mitigation potential. There is no agreed conversion to generate GtCO2-eq yr-1. For instance the methane metrics in IPCC AR5 WG 1 table 8.7 vary by a factor of 20. [William Collins, United Kingdom (of Great Britain and Northern Ireland)]	We are using the same GWPs as used in national GHG inventories
7801	23	11	23	11	(Chapter 3; (Archer et al.,2011); Miao et-->(Chapter 3; Archer et al.,2011; Miao et [Hiroaki Kondo, Japan]	References were corrected
26293	23	12	23	12	should read: "2015) and for for prevention" [Aaron Smith, Norway]	Agreed
7803	23	12	23	12	for for --> for [Hiroaki Kondo, Japan]	Corrected
7805	23	15	23	15	(Chapter 5; (Herrero et al. 2016).-->(Chapter 5; Herrero et al. 2016). [Hiroaki Kondo, Japan]	Agreed
10059	23	19	23	20	important aspects of grazing management include rest periods, especially to ensure seed set, and adjustment of grazing pressure especially in drought to maintain ground cover. Also, management of total grazing pressure - ie including native and feral herbivores - is important in rangelands. [Jean-Luc Chotte, France]	This has been revised
10051	23	24	23	24	Mentioning this estimate is only useful if also the conditions/assumptions are given: implementation of what alternative management on how much of the world arable area. There are multiple studies in the lieterature, also on what are feasible areas, and this needs to be explained and substantiated. A bit is in Ch 2 but here the number is mentioned so also the conditions are required. [Jean-Luc Chotte, France]	Done

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7807	23	25	23	25	(Chapter 2; Section 6.4; (Herrero et al.-->(Chapter 2; Section 6.4; Herrero et al. [Hiroaki Kondo, Japan]	References were corrected
7809	23	28	23	28	(Chapter 3; (Archer et al-->(Chapter 3; Archer et al [Hiroaki Kondo, Japan]	References were corrected
7811	23	31	23	31	Chapter 5; (Herrero et al.-->Chapter 5; Herrero et al. [Hiroaki Kondo, Japan]	References were corrected
10061	23	33	23	34	yes, therefore it is not a response option of itself [Jean-Luc Chotte, France]	This has been addressed in th revision - and land sparing uncertainties added
22797	23	35	23	35	'achieved in a sustainable way'. This is not sufficiently specific: what is 'a sustainable way' in this context (and in the underlying literature) [Anastasios Kentarchos, Belgium]	This has been addressed in th revision - and land sparing uncertainties added
10053	23	35	23	35	'achieved in a sustainable way'. This is not sufficiently specific: what is 'a sustainable way' in this context (and in the underlying literature) [Jean-Luc Chotte, France]	This has been addressed in th revision - and land sparing uncertainties added
10063	23	37	23	38	yes, so why not call this option sustainable intensification? [Jean-Luc Chotte, France]	This has been addressed in th revision - and land sparing uncertainties added
22799	23	47	23	47	'implemented sustainably'. This is not sufficiently specific: what is 'a sustainable way' in this context (and in the underlying literature) [Anastasios Kentarchos, Belgium]	This has been addressed in th revision - and land sparing uncertainties added
10055	23	47	23	47	'implemented sustainably'. This is not sufficiently specific: what is 'a sustainable way' in this context (and in the underlying literature) [Jean-Luc Chotte, France]	This has been addressed in th revision - and land sparing uncertainties added
7813	23	48	23	48	(e.g., (Lal 2016).-->(e.g., Lal 2016). [Hiroaki Kondo, Japan]	Done
28673	23	32		48	increase in food productivity(which could rise from many other interventions such as improved crop land,grazing land and livestock management) could help in addressing a number of the land challenges, but only if it is achieved through in a sustainable way. I strongly recommend sustainable process in climate change adaptive response in large increase of food production. I recommend land use sustainability process as to combat the negative of food production. But climate change and sustainable adaptive response by human can change land use management system in agriculture food production techniques. Therefore strong implementation in Re-Use and Re-plant process should be implemented for positive intensification of land use use management in relation to desertification. [Abiodun Adegoke, Nigeria]	This has been addressed in th revision - and land sparing uncertainties added
21567	23	32			This section should spell out more clearly that increased food productivity is only a mitigation option if it is coupled with policies or other incentives that create land sparing rather than simply more food. I.e. a strong link to demand management and the need for policy that goes beyond increasing food productivity as such if it is meant as a solution to the broader set of land challenges. This is quite an important point that I think deserves to be raised more prominently including in the executive summary. Also please work with chapter 5 to develop a glossary definition of "sustainable intensification". [Andy Reisinger, New Zealand]	This has been addressed in th revision - and land sparing uncertainties added
25107	23	37			Below is one early article that pointed out and quantified the large inputs of agro-chemicals resulted in large negative externalities on a global scale. It should be added. Liu J., You L.Z., Amini M., Obersteiner M., Herrero M., Zehnder A.J.B., Yang H. 2010. A high-resolution assessment on global nitrogen flows in cropland. Proceedings of the National Academy of Sciences of the United States of America 107(17): 8035-8040. [Junguo Liu, China]	This has been addressed in th revision - and land sparing uncertainties added
10065	24	1	24	5	this is contradictory: first you say that intensified land use is bad, and then that it can be good. Above you state irrigation in drylands as a beneficial response option. [Jean-Luc Chotte, France]	This has been addressed in th revision - and land sparing uncertainties added

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26295	24	7	24	7	should read: "(Godfray et al. 2010b; Godfray et al. 2010)." [Aaron Smith, Norway]	Corrected in Godfray et al. 2010.
30559	24	8	24	37	The secrtion on agroforestry makes no mention of indigenous and customary agroforestry systems and their proven potential for sustaiable land management and the maintenance and regeneration of soil and forest carbon stocks. This is a significant omission and should be rectfied in the final IPCC report. See for example Mutuo, P. K., Cadisch, G., Albrecht, A., Palm, C. A., Verchot, L. (2005) "Potential of agroforestry for carbon sequestration and mitigation of greenhouse gas emissions from soils in the tropics Nutrient Cycling" Agroecosystems, 71(1)(2005): 43-54. See also Albrecht, A., Kandji, S. T. (2003) "Carbon sequestration in tropical agroforestry systems Agriculture" Ecosystems and Environment 99(1/3)(2003):15-27 In terms of policy options, there is a need for greater public policy recogntion of the potential of indigenous agrforesry systems to mitigate climate change and provide multiple co-benefits for local communites, includung food security and resilience to climate change. Greater recognition should be given to indigenous peoples' own assessments and studies of their farming systems. See for example, Andoque, I and Castro H (2013) The life of the chagra: local traditional knowledge and practices for climate change adaptation Tropenbos, Bogotá [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	The role of agroforestry systems for both mitigation and adaptation is already recognized in tab 6.4. Now, the ref to Mutuo et al. 2015 has been added,as suggested. A discussion on the role of indigenous people is beyond the scope of this chapter. More on this an be found in chapter 7
39829	24	9	24	9	Remove term "sustainable". Agroforestry is not inherently a sustainable land management practice. [, United States of America]	Removed
21277	24	9	24	10	Is agroforestry by definition sustainable? This seems controversial. Please clarify this statement. [, United Kingdom (of Great Britain and Northern Ireland)]	In this chapter, both positive and adverse effects of response options of agroforestry are examined.
10067	24	11	24	12	The universal substitution of ES with NCP is particularly inappropriate in this case. The term "payments for environmental services" abbreviated as PES, is well-known. There is no such recognition of "payments for nature's contributions to people". In fact a google search on 3 January 2019 can find NO results for the expression "payments for nature's contributions to people". The paper cited does not use this term. (Its not in the reference list but I assume it is either Benjamin, E.O., Ola, O. and Buchenrieder, G., 2018. Does an agroforestry scheme with payment for ecosystem services (PES) economically empower women in sub-Saharan Africa?. Ecosystem Services, 31, pp.1-11. or Benjamin, E.O. and Sauer, J., 2018. The cost effectiveness of payments for ecosystem services—Smallholders and agroforestry in Africa. Land Use Policy, 71, pp.293-302.) [Jean-Luc Chotte, France]	Decision taken to use NCPs at Bureau level
26297	24	13	24	13	should read: "shocks." [Aaron Smith, Norway]	Done
7815	24	13	24	13	shocks).-->shocks. [Hiroaki Kondo, Japan]	Done
2891	24	14	24	24	There are also potential mitigation benefits (and costs?) related to non GHG emissions climate effects of agroforestry. [David Kaimowitz, Nicaragua]	Yes, there are some costs; however, the benefits outweighs the cost under the interlinkages highlighted here the chapter
10069	24	16	24	20	Logic not clear: demonstrating that a small proportion of ag land (in one region) is under agroforestry does not provide conclusive evidence of the potential. You need an estimate of the proportion of ag land that is suitable for agroforestry. [Jean-Luc Chotte, France]	This about the demonstration of the potentials of the system irrespective of the region. Providing global estimates of proportion of land under agroforestry will not change its pontential as a response measures and highlighted here
10071	24	23	24	28	poorly worded, hard to follow [Jean-Luc Chotte, France]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14323	24	26	24	28	Diverse farm systems based on The mimicking or restoring natural ecosystems such as FMNR have clear benefits for increases in food security (Vignola et al. 2015; Dinesh. et al, 2015, Pye-Smith. 2013; Reij et al, 2009). [Samba Sow, Senegal]	Done
6091	24	27	24	27	the [, Poland]	Done
7817	24	27	24	27	The --> the [Hiroaki Kondo, Japan]	Done
21279	24	30	24	32	What is "Natures Contribution to People"? I don't think this is a widely understood term. This comment applies throughout the report. [, United Kingdom (of Great Britain and Northern Ireland)]	Decision taken to use NCPs at Bureau level
10073	24	30	24	32	Again, the substitution of ES with NCP makes no sense: the term provisioning applies to the ES as described in the MA. NCP does not use these terms. See Cross-Chapter Box 7, Table 1 Comparison of MA and IPBES categories and types of ES and NCPs. [Jean-Luc Chotte, France]	Decision taken to use NCPs at Bureau level
25591	24	38	24	38	We suggest to consider also "Improved forest management" (IFM). See GENERAL COMMENT ON IMPROVED FOREST MANAGEMENT (IFM). [, France]	Accepted
15647	24	39	24	42	Wouldn't make any harm to refer explicitly to climate. [Tuomo Kalliokoski, Finland]	The text reported is consistent with the definition of sustainable forest management by ForestEurope. Implicitly, the regulation of climate refers to "fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels".
26299	24	43	24	43	should read: "growth of trees" [Aaron Smith, Norway]	Corrected
2895	24	38	25	31	Sustainable community forest management merits a discussion of its own - wether here or elsewhere in the chapter. A great deal of peer-reviewed articles point to the successes of community forest management in Mexico, Nepal, Guatemala, Tanzania, and elsewhere. [David Kaimowitz, Nicaragua]	The importance of Community-based forest management is added in the section of deforestation (tab 6.4) where the ref to Pelletier e tal. 2017 is added, and in section on improved forest management where the ref Chhatre & Agrawal 2009 has been added. More info on this is in Chapter 7, section 7.7.4).
2907	24	38	25	31	Recent peer-reviewed articles about the climate benefits of community forest management include: F.W. Cubbage et al 2015 Journal of Sustainable Forestry. A.A. Min-Venditti, G.W: Moore, and F. Fleischman. 2017 Global Environmental Change. J. Pelletier, N. Gelinas, and M. Skutsch. 2016. Forests. L. Porter-Bolland et al. 2012.Forest Ecology and Management. A. Blackman. 2015. Ecological Economics. [David Kaimowitz, Nicaragua]	The importance of Community-based forest management is added in the section of deforestation (tab 6.4) and the ref to Pelletier e tal. 2017 is added. More info on this is in Ch 7
27253	24	38	25	31	Section 6.3.1.7: Forest landscape restoration is a broader concept than sustainable forest management as this is mostly happening on forest land remaining forest land whereas land-use changes, agroforestry, agrosylvopastoral systems and trees outside forests are not considered, this narrowing down of Forest landscape restoration to secondary forests would forgive most of the potential of forest landscape restoration as envisaged by Aichi target 15 or the Bonn Challenge. Therefore, the authors should please explain that the scope of the concepts varies, forests can also remain unused and develop into close to nature forests and in the chapter do not subsume forest landscape restoration under sustainable forest management, but consider measures of forestry and agriculture. Please see also our related comments on the glossary. [, Germany]	Forest restoration in now treated with reforestation. Forest restoration refers to practices aimed at regaining ecological integrity in a deforested or degraded forest landscape. As such, it could fall under reforestation if it were re-establishing trees where they have been totally lost, or under forest management if it were restoring forests where not all trees have been lost. For practical reasons, here forest restoration is treated together with reforestation.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39831	24	38	25	31	The authors state that they have combined reforestation and sustainable forest management into a single category, but the logic for doing so is very weak and in fact this aggregation causes problems. The two categories should be separated and treated individually. The mitigation potential lies mostly with reforestation. (Admittedly, there is a problem with climate change as to how areas transition from one category to the other, but that takes place over a long period of time. Over the next few decades it is relatively easy to identify forest and non-forest areas.) [, United States of America]	We combined "sustainable forest management" with "forest restoration". Reforestation is treated separately. Apart from this, maintaining and strengthening long term carbon sinks in degraded forests and forest lands are achievable targets by both forest management and restoration. Mitigation potentials by land-based options are clearly reported (and supported by scientific literature) in Table 6.4 (page 43).
17235	24	38	25	31	Section 6.3.1 aims to present details of response options shown in Table 6.2, therefore the title for sub-section and its order of decsription under section 6.3.1 should be consistent with that in the table 6.2. With that view, it is suggested to separate 2 options sustainable forest management and forest restoration. The mentioned option "forest restoration" is currently not in table 6.2. Sustainable forest management implies for different aspects of economic, social and environment. [Hoang Anh Le, Vietnam]	Forest restoration in now treated with reforestation. Forest restoration refers to practices aimed at regaining ecological integrity in a deforested or degraded forest landscape. As such, it could fall under reforestation if it were re-establishing trees where they have been totally lost, or under forest management if it were restoring forests where not all trees have been lost. For practical reasons, here forest restoration is treated together with reforestation.
30561	24	38	25	31	This sub section on SFM is perfunctory, timber and carbon centric without mention od SES, governance and tenure matters. As it stands, this sub section leaves much unsaid about core preconditions for sustainable management forest ecosystems, which include effective measures to uphold and protect the rights of forest peoples and forest dependent communities. To this end, this section should also include references to rights-based approaches to SFM, good forest governance and forest law enforcement (see, for example, Colchester M et al (2006) Justice in the Forest: rural livelihoods and forest law enforcement CIFOR, Bogor).There is not explicvit mention of the value fo community-based forest management grounded in secure collective tenure and the application of traditional knowledge and customary laws for the sustainable harvets of forest products and protection of high conservation value forests - see for example Bray D et al (Eds) (2005) The Community Forests of Mexico: Managing for Sustainable Landscapes University of Texas Press; [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	The importance of Community-based forest management is added in the section of deforestation (tab 6.4) and the ref to Pelletier e tal. 2017 is added. A detailed discussion of community forest management is beyond the scope iof this chapter. More info on this is in Ch 7.
8327	24	9	28		Some nuance is needed. Agroforestry has clear negative effects on production if trees are not producing useful products as more land will be needed for food production. The negative effect of shading by trees by far outweigh the positive effects, even when including Alnus or other N fixing trees (see work of Ndoli et al. 2018; Sida et al. 2018). It needs to be seen if mixing agriculture with trees is better than separating these functions. Most strong positive effects may come from increased rainfall and temperature reducting but not much has been quantified in literature, with exception of theoretical explorations. [Antonius Schut, Netherlands]	In this chapter, both positive and adverse effects of response options of agroforestry are examined.
8329	24	9	28		Ndoli, A., F. Baudron, A. G. T. Schut, A. Mukuralinda and K. E. Giller (2017). "Disentangling the positive and negative effects of trees on maize performance in smallholdings of Northern Rwanda." Field Crops Research 213: 1-11. [Antonius Schut, Netherlands]	Even if the contents are interesting, the suggested citation refers to a limited geographical area.
8331	24	9	28		Ndoli, A., F. Baudron, T. S. Sida, A. G. T. Schut, J. van Heerwaarden and K. E. Giller (2018). "Conservation agriculture with trees amplifies negative effects of reduced tillage on maize performance in East Africa." Field Crops Research 221: 238-244. [Antonius Schut, Netherlands]	Even if the contents are interesting, the suggested citation refers to a limited geographical area.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8333	24	9	28		TS Sida, F Baudron, K Hadgu, A Derero, KE Giller, 2018. Crop vs. tree: Can agronomic management reduce trade-offs in tree-crop interactions? Agriculture, Ecosystems & Environment, 260: 36-46. [Antonius Schut, Netherlands]	Reference added
7409	24	43			Correct 'tress' to trees [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Corrected
31779	25	3	25	14	Sustainable forest management is also a prerequisite for BECCS deployment, as bioenergy should be provided with zero or low carbon emissions [Piera Patrizio, Austria]	The implications from bioenergy and BECCS (and interlinkages with land management) are extensively discussed in other sections
25745	25	3	25	14	forest management should consider carbon sourcing, for power-to -gas hydrocarbon synthesis using hydrogen from variable renewable energy sources to improve long lived wood products , biomass stock and fuels mix. [Roque Pedace, Argentina]	HWP and material substituion is considered elsewhere, the other issues are ourside the scope of the chapter
26301	25	4	25	4	should read: "dead organic matter, and soil" [Aaron Smith, Norway]	Agreed. Changed.
5691	25	9	25	10	needs to be more clear! [Sanaz Moghim, Iran]	Reworded
27255	25	10	25	13	The most effective carbon mitigation strategy depends on the context, this can be afforestation, assisted or non-assisted reforestation or carbon optimized sustainable forest management, but for densely populated areas or under a changing climate a resilient forest might be the most effective mitigation strategy as it has co-benefits for hydrology, biodiversity and temperature. Therefore, please amend the text: "More harvest decreases the carbon in the forest in the short term but could - depending on the long-levity of the harvested wood product - increase the carbon in wood products and the potential for substitution effects." [, Germany]	Now reflected in the text
15649	25	10	25	13	The end-result of optimization depends on the objective. In the current form, this sentence does not say anything of from which viewpoint carbon is optimized in forests and products. Optimal solution from atmospheric viewpoint could differ drastically from optimal short term economic solution. [Tuomo Kalliokoski, Finland]	The sentence aims to suggest an holistic approach to C management (i.e. not only in the forest). In sustainable forest management, optimization is achieved through balancing multiple benefits . This is also recalled by Canadell and Raupach (2008; DOI:10.1126/science.1155458): "Principles of sustainability must govern the resolution of trade-offs that may arise from ancillary effects in order to simultaneously maximize climate change protection and sustainable development". If the objective is primarily mitigation, sustainable forest management is oriented to balance the carbon accumulation in stands and substitution in forest products . On the other hand, the trade-offs between maintaining carbon stock in forest stands, and increasing the amount of harvested wood and the associated revenues often depend on specific contexts (e.g. forest age)
6093	25	12	25	12	in forest and in long-lived wood products [, Poland]	Modified, accordingly.
2893	25	13	25	14	Forest management also affects biological and inorganic aerosols, surface roughness, and other variables that affect climate. [David Kaimowitz, Nicaragua]	These details are beyond the scope of this chaper, and are dicussed in ch 2
25593	25	13	25	14	A sentence should be added to highlight trade-offs for forest management among climate objectives, using Luyssaert et al. (2018). - Luyssaert, S., Marie, G., Valade, A., Chen, Y. Y., Djomo, S. N., Ryder, J., ... & McGrath, M. J. (2018). Trade-offs in using European forests to meet climate objectives. Nature, 562(7726), 259. [, France]	included
15651	25	13	25	14	Forest management also affect BVOC production and thus SOA formation and through feedback loops also other things. Please see Nikinmaa et al. 2017 Biogeoscience Discussion https://doi.org/10.5194/bg-2017-141, Kulmala et al. 2014 http://hdl.handle.net/10138/228728 [Tuomo Kalliokoski, Finland]	Luyssaert, S., Marie, G., Valade, A., Chen, Y. Y., Djomo, S. N., Ryder, J., ... & McGrath, M. J. (2018). Trade-offs in using European forests to meet climate objectives. Nature, 562(7726), 259.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26203	25	15	25	26	Add reference: Chia, E.L., Kalame, F., Kanninen, M. 2016. Exploring Opportunities for Promoting Synergies between Climate Change Adaptation and Mitigation in Forest Carbon Initiatives. Forests 7, 24. doi:10.3390/f7010024 [Markku Kanninen, Finland]	Not clear which sentence or text part the suggested citation specifically refers to. Despite the interest, the contents of the suggested publication (focusing on carbon initiatives) are too broad for the scope of this section.
26205	25	15	25	26	Add reference: Sonwa, D.J., Walker, S., Nasi, R., Kanninen, M. 2011. Potential synergies of the main current forestry efforts and climate change mitigation in Central Africa. Sustainability Science 6, 59-67. Doi: 10.1007/s11625-010-0119-8 [Markku Kanninen, Finland]	Even if the contents are interesting, the suggested citation refers to a limited geographical area.
15653	25	17	25	18	Matthies et al. 2015. Risk, reward, and payments for ecosystem services: A portfolio approach to ecosystem services and forestland investment. Ecosystem Services 16:1 - 12. [Tuomo Kalliokoski, Finland]	Even if the contents are interesting, the suggested citation refers to a limited geographical area.
10077	25	23	25	24	inaccurate wording: selective logging is mid-way (in terms of disturbance per ha) between clearfell logging and no logging. (deforestation means that there is no re-establishment of forest; that is land use change, not a forestry practice). Selective logging maintains some level of forest cover over the site, but requires disturbance of a greater area of forest to obtain the same amount of timber. [Jean-Luc Chotte, France]	Agreed. The sentence was changed
22801	25	23	25	25	"selective logging" is here presented as a positive 'midlle way' without mentioning the potential additional forest area disturbed for obtaining a similar harvest size. "Selection logging" would seem more appropraite to use, as that indicates a purposeful management activity, whilst "selective logging" is often used for opportunistic, unprofessional tree harvest (also known as "high grading"), that is a driver of degradation. Furthermore, There is a clear tradeoff between selection logging over a large area and clear-cut over a smaller area. This depends very much on the forest type and the type of wood aimed at, and it is particularly well documented for tropical forests and undisturbed forests. [Anastasios Kentarchos, Belgium]	Agreed. The sentence was changed
10075	25	23	25	25	selective logging is here presented as a positive 'midlle way' without mentioning the potential additional forest area disturbed for obtaining a similar harvest size. There is a clear tradeoff between selective logging over a large area and clear-cut over a smaller area. This depends very much on the forest type and the type of wood aimed at. [Jean-Luc Chotte, France]	Agreed. The sentence was changed
39833	25	23	25	26	Selective logging is not a "middle way" between deforestation and total protection, unless this chapter is referring to selective logging as maintaining the balance between biodiversity, carbon, forest needs, etc. Is selective logging the normal harvesting technique to maintain all forest ecosystem services? Selective logging is generally categorized as closer to "total protection" than deforestation. [, United States of America]	Agreed. The sentence was changed
10079	25	27	25	27	provide examples of SFM practices that could have these outcomes. [Jean-Luc Chotte, France]	Examples were provided: "Forest management strategies aiming at increasing the biomass stocking levels (e.g. thinning methods, species selection) may also have …".
10081	25	30	25	30	windthrow is one word, singular [Jean-Luc Chotte, France]	This word has been removed
10083	25	30	25	31	awkward wording [Jean-Luc Chotte, France]	Agreed. The sentence was changed into: "Forest restoration may threaten livelihoods local access to land if subsistence agriculture is targeted.".

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39835	25	32	25	34	Very strange definition of agricultural diversification -- really more about some of the consequences of diversification than a definition although it is written like a definition. A more helpful start to this section would include some discussion of how diversification can happen on different scales (farm to landscape) and can be driven (accelerted or impeded) by supply-side incentives or the nature of international markets. This unfortunately reflects much of the writing in the report -- so general as to have not much meaning or somewhat confused rather than a clear synthesis and reflection of the research literature. [, United States of America]	accepted. The paragraph was rewritten and considerations included.
26303	25	36	25	36	suggest: "composed of a suite" [Aaron Smith, Norway]	accepted
10085	25	36	25	37	Thus diversification generally means lower production of staple foods (wheat, rice, maize). farm income may be maintained or even increased, and resilience of the farming system is likely to be enhanced, but there is a risk of indirect land use change if the global demand for staple foods is maintained. This should be acknowledged. [Jean-Luc Chotte, France]	accepted.see response to comment 26303
39837	25	42	25	43	"… likely few adverse side effects ...": A few examples should be included here to be consistent with other sections. [, United States of America]	accepted. The paragrasph was rewritten
1935	25	43	25	43	I suggest authors mention a few of these adverse side effects. [William Lahoz, Norway]	accepted. The paragrasph was rewritten
10087	25	45	25	45	not clear how non-ag employment affects diversification of agricultural production [Jean-Luc Chotte, France]	accepted. Labor competence.
26305	25	46	25	56	should read: "and it recognizes certain" [Aaron Smith, Norway]	accepted
29413	25	38			Diversification can also reduce the risk of crop patogens spreading across landscapes. [Bojana Bajzelj, United Kingdom (of Great Britain and Northern Ireland)]	accepted
10089	26	2	26	2	tillage may increase the risk of wind and water erosion but it is not an erosion process [Jean-Luc Chotte, France]	accepted. Tillage deleted
10091	26	6	26	6	do you mean rotational grazing systems? [Jean-Luc Chotte, France]	accepted
10093	26	9	26	12	Explain that it depends where the soil ends up - if it is deposited in waterways it is likely to be protected; if it is carried in dust storms to warmer, moister environments, it is likely to be respired. Cite recent work on this topic esp Chappell, A., Baldock, J. and Sanderman, J., 2016. The global significance of omitting soil erosion from soil organic carbon cycling schemes. Nature Climate Change, 6(2), p.187.; Berhe, A.A., Barnes, R.T., Six, J. and Marín-Spiotta, E., 2018. Role of soil erosion in biogeochemical cycling of essential elements: Carbon, nitrogen, and phosphorus. Annual Review of Earth and Planetary Sciences, (0). [Jean-Luc Chotte, France]	accepted and many thanks!
39839	26	19	26	19	Conceptually it is difficult to see this as having no adverse effects. More evidence should be provided to support this statement. [, United States of America]	not accepted. Any evidence was found in literature about possible adverse side effects of soil erosion manegement and control.
10095	26	23	26	27	explain how salinsation occurs, and therefore how these practices address it. Separate dryland salinity from irrigation salinity. Discuss the risk that irrigation in drylands, to enhance productivity, leads to high risk of salinisation, and how this can be reduced. It is not clear how increasing SOM and livestock management can prevent or reverse salinisation. [Jean-Luc Chotte, France]	accepted. Paragraph rewritten
10097	26	35	26	36	illogical: desertification IS land degradation in the drylands [Jean-Luc Chotte, France]	accepted. Corrected
26307	26	38	26	38	should read: "(Chapter 5, Section 6.5 this Chapter)." [Aaron Smith, Norway]	accepted
10099	26	39	26	39	explain that this is because high water use efficiency irrigation systems require more energy to operate and more capital to establish than open channel gravity-fed systems [Jean-Luc Chotte, France]	accepted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10101	26	41	26	41	crop rotations with deep-rooted species [Jean-Luc Chotte, France]	accepted
28677	26	1		19	Soil prevention and management, protection and techniques mustvbe implemented. Prevention of soil compaction must be implemented in relation with soil conservation, soil science and soil health management. In relation to climate change can lead to the emissions of Nitrous oxide (N2O) a major green gouse gas and air pollutants. Studies have shown using Biocha would decrease nitrous oxide emissions from soil by an average of 54 per cent.(Social impact Open Repository 2017). [Abiodun Adegoke, Nigeria]	not accepted. It is not related to the paragraph that deals with soil erosion control
7465	26	15		17	Ground cover has been shown to be one of the most important measures to control erosion. Our research in the mountains of Central America has focused on finding the erosion threshold through the minimum value of soil cover that allows erosion control. We think that this section could be completed with the following paragraph: "Recent publications have established that in order to achieve effective erosion control in mountain areas in Nicaragua a minimum threshold of soil cover of 60-65% is necessary in agroforestry systems of coffee (Coffea arabica) and shade trees of Inga spp and Musa spp (Blanco and Aguilar, 2015) and in crops of bean (Phaseolus vulgaris L.) under no-tillage (Blanco and Aguilar, 2016) ". References later. [Rafael Blanco-Sepulveda, Spain]	accepted. Päragraph included.
28675	26	40		48	Prevention of soil compaction is mainly based on agriculture techniques (Crop rotation,control of livestock density). I recommend prevention process to implemented in soil science and Agronomy,since is the main driver of both desertification and land degradation. [Abiodun Adegoke, Nigeria]	not accepted. Cannot understand
10103	27	3	27	4	purchase of GPS-controlled autosteer tractors that operate on laser-levelled fields is a substantial entry cost for CTF! [Jean-Luc Chotte, France]	accepted
25595	27	6	27	6	A word should be added about recent mega-fires, especially those in 2017 a,d 2018 summers, even if it is to say that scientific knowledge is still too recent to be considered in this report. [, France]	Mega fires in 2017 is described in Chapter 2, Box 3, and it is not repeated here to avoid duplication.
2897	27	6	27	30	Fire management is an area where Indigenous knowledge has particular relevance. Government fire agencies in Australia, Brazil, Canada, United States, and elsewhere are increasingly learning from Indigenous fire management practices. [David Kaimowitz, Nicaragua]	This part is reduced or removed from the text avoid excessive duplication with other chapters.
39841	27	6	27	30	In this chapter, does fire management not include practices such as forest thinnings? This would have impacts on hydrology and soil, could have economic impacts, etc. Is forest thinnings for fire management thought of as something else? [, United States of America]	This part is reduced or removed from the text avoid excessive duplication with other chapters.
18135	27	6	27	30	Straw and crop residues burning, including prescribed burning was not mentioned as a measure of sustainable cropland management. [Vladimir Romanenkov, Russian Federation]	This part is reduced or removed from the text avoid excessive duplication with other chapters.
26309	27	7	27	7	should read: "life, property, and resources" [Aaron Smith, Norway]	Corrected
10105	27	13	27	13	you are describing regeneration, not reforestation - it is "forest remaining forest" - there is no LUC [Jean-Luc Chotte, France]	Corrected
5693	27	19	27	20	needs year and location, is it global emissions! [Sanaz Moghim, Iran]	Corrected according to Chapter 2 (Box 3).
15655	27	19	27	20	During what time span? Or is this per year? [Tuomo Kalliokoski, Finland]	Corrected according to Chapter 2 (Box 3).
12967	27	20	27	20	Is this 1.75 GtCO2 from fires pure CO2 or does it include methane and N2O. If so what conversion factors are used and why? [William Collins, United Kingdom (of Great Britain and Northern Ireland)]	Corrected according to Chapter 2 (Box 3).
10107	27	21	27	24	logic not clear [Jean-Luc Chotte, France]	Corrected according to Chapter 2 (Box 3).
10109	27	25	27	26	this may be true for forests on steep slopes; it is certainly not the case for cropland or pastures in higher rainfall areas. [Jean-Luc Chotte, France]	Corrected
32613	27	27	27	29	adding in the rangeland management through livestock the co-benefit of fire management? [Marta Guadalupe Rivera-Ferre, Spain]	Corrected

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2875	27	34	27	34	I think 'storm surge' is only singular. [Luca Castrucci, United States of America]	accepted
7819	27	36	27	38	It is doubtful to say that "The prevention and management of landslides and natural hazards would be expected to be neutral or deliver only small global benefits for mitigation, since it has little impact of GHG emissions or on eventual preservation of topsoil carbon stores", because those landslides due to heavy rains by typhoons recently cause huge loss of top soil and enormouse drift woods, which evetually cause to emission of CO2. e.g. https://www.reuters.com/article/idUSTP278096 [Hiroaki Kondo, Japan]	accepted
5695	27	36	27	38	"The prevention and management of landslides and natural hazards …small global benefits for mitigation", why? I disagree and why "it has little impact of GHG emissions"? [Sanaz Moghim, Iran]	accepted
40801	27		27		missing link to x chapter box on fire. Needs to integrate more on outcomes of all chapters. [Valerie Masson-Delmotte, France]	Chapter 2, Box is referred.
22803	28	1	28	47	This chapter on Ecosystem-based adaptation is very welcome, but it is only scratching the surface. There is a lot of work done and ongoing, which is nit covered in this 1page section. Perhaps best ADD REFERENCE TO THE CBD WORK on ecosystem-based adaptation and disaster risk reduction [Anastasios Kentarchos, Belgium]	OK refs aded
12265	28	1	28	47	based adaptation yet includes information relevant to other sub-sections eg cropland management. Please focus just on ecosystems eg reintroduction of large grazers etc as an example see Bakker and Svenning 2018 Philos Trans R Soc Lond B Biol Sci 373(1761): 20170432 [Hans Poertner and WGII TSU, Germany]	This is a too limited definiton of EBA.
2877	28	12	28	12	I think 'storm surge' is only singular. [Luca Castrucci, United States of America]	EBA is no longer discussed as a response option
21281	28	19	28	20	It is more than a temporary increase in CH4 emissions - see https://doi.org/10.5194/bg-12-4361-2015 . Suggest deleting 'temporarily'. [, United Kingdom (of Great Britain and Northern Ireland)]	EBA is no longer discussed as a response option
10111	28	20	28	21	? the problem is that it may REDUCE albedo [Jean-Luc Chotte, France]	EBA is no longer discussed as a response option
15657	28	20	28	21	Yes, but again BVOCs and SOA effect on clouds should be kept in mind. The increased cloud albedo through this mechanism is not accounted for in study of Betts and thus quite likely albedo effect of afforestation is overestimated. [Tuomo Kalliokoski, Finland]	EBA is no longer discussed as a response option
10113	28	27	28	29	covered in other sections, not applicable here. [Jean-Luc Chotte, France]	EBA is no longer discussed as a response option
26311	28	28	28	28	should read: "water to arid areas might" [Aaron Smith, Norway]	EBA is no longer discussed as a response option
7821	28	28	28	28	areas) --> areas [Hiroaki Kondo, Japan]	EBA is no longer discussed as a response option
26313	28	40	28	40	should read: "also compete with" [Aaron Smith, Norway]	EBA is no longer discussed as a response option
25597	29	1	29	1	A word about REDD+, and the most recent figures, should be added to this section. It would also be necessary to highlight several risks, such as non-additionnality, non-permanency and leakage risks. [, France]	REDD+ is now mentioned. Risks, such as non-additionnality, non-permanency and leakage are added in the Appendix (feasibility table)
2899	29	4	29	7	This would be a good place to mention community forest management. [David Kaimowitz, Nicaragua]	Added: "Community forest management has proven a viable model for sustainable forestry, including for carbon sequestration (Chhatre & Agrawal 2009, Chapter 7, section 7.7.4)."
26315	29	5	29	5	should read: "pest outbreaks, and wildfires" [Aaron Smith, Norway]	Corrected
26317	29	7	29	7	should read: "(Hosonuma et al. 2012; Curtis et al. 2018)" [Aaron Smith, Norway]	Corrected
10115	29	8	29	9	AVOIDING deforestation and forest degradation has high mitigation potential! [Jean-Luc Chotte, France]	Corrected

Comment No	From Page	From Line	To Page	To Line	Comment	Response
15659	29	9	29	10	Please clarify what forest regrowth means in the context of stopping deforestation. [Tuomo Kalliokoski, Finland]	Descriptions using "afforestation", "reforestation", and "regrowth" are revised in the overall text.
10117	29	10	29	12	sentence not clear; key biophysical effect is loss of C stocks; major compared with other response options or other climatic regions? [Jean-Luc Chotte, France]	Agreed. The sentence was modified as follow: "Because of the combined climate impacts of GHGs and biophysical effects, reduced deforestation has a major climate mitigation effect in the tropics (Alkama and Cescatti 2016)."
15661	29	10	29	12	Lacking BVOC and SOA as a factor and their effect on net impact. [Tuomo Kalliokoski, Finland]	This is addressed in Ch 2
26319	29	15	29	15	should read: "(Lewis et al. 2015; Dooley and Kartha 2018; Barlow et al. 2016)" [Aaron Smith, Norway]	The sentence has been changed
2901	29	16	29	18	The effects on evapotranspiration, surface roughness and aerosols of avoiding deforestation may also be different from reforestation. [David Kaimowitz, Nicaragua]	The sentence refers to biophysical effects, treated elsewhere
7547	29	24	29	39	Reductions of SLCPs reduce warming in the near term and the overall rate of warming, which can be crucial for plants that are sensitive to even small increases in temperature (as well as other vulnerable systems that could be edged beyond tipping points and trigger self-reinforcing feedbacks). See UNEP (2017) The Emissions Gap Report, xv ("The report also covers an assessment of the potential contribution from reductions in short-lived climate pollutants (SLCPs), although they are not directly comparable with reductions in long-lived greenhouse gases. Reductions of SLCPs limit the rate of short-term warming, and when sustained and combined with CO2 reductions, these reductions also help to limit long-term warming, which is the ultimate aim of closing the emissions gap."); Xu et al 2013 ("This estimate is consistent with RX10, which would also yield 0.5 C avoided warming if only CH4, O3, and BC were mitigated. All three studies calculated that full implementation of mitigation measures for these three SLCPs can reduce the rate of global warming during the next several decades by nearly 50%. Furthermore, Arctic warming can be reduced by two-thirds over the next 30 yr compared to business as usual (BAU) scenarios (UNEP and WMO, 2011)."); UNEP & WMO (2011) INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE: SUMMARY FOR DECISION MAKERS, 10–11 ("When all measures are fully implemented, warming during the 2030s relative to the present day is only half as much as if no measures had been implemented. In contrast, even a fairly aggressive strategy to reduce CO2 emissions under the CO2 measures scenario does little to mitigate warming over the next 20–30 years. In fact, sulphate particles, reflecting particles that offset some of the committed warming for the short time they are in the atmosphere, are derived from SO2 that is co-emitted with CO2 in some of the highest-emitting activities, including coal burning in large-scale combustion such as in power plants. Hence, CO2 measures alone may temporarily enhance near-term warming as sulphates are reduced…;temperatures in the CO2 measures scenario are slightly higher than those in the reference scenario during the period 2020–2040)."). [Durwood Zaelke, United States of America]	Co-benefit of SLCP reduction on climate mitigation is emphasized. The interactions between climate and air pollutants including short-lived climate forcers (SLCFs) are described Chapter 2 in detail, and it is not repeated here to avoid duplication. UNEP (2017), UNEP and WMO (2011), Xu et al. (2013), and Chapter 2 are refered.
7623	29	24	29	39	Reductions of SLCPs reduce warming in the near term and the overall rate of warming, which can be crucial for plants that are sensitive to even small increases in temperature (as well as other vulnerable systems that could be edged beyond tipping points and trigger self-reinforcing feedbacks). See UNEP (2017) The Emissions Gap Report; Xu Y., et al. (2013) The role of HFCs in mitigating 21st century climate change, Atmos. Chem. Phys. 13:6083–6089; UNEP & WMO (2011) INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE: SUMMARY FOR DECISION MAKERS. [Kristin Campbell, United States of America]	Co-benefit of SLCP reduction on climate mitigation is emphasized. The interactions between climate and air pollutants including short-lived climate forcers (SLCFs) are described Chapter 2 in detail, and it is not repeated here to avoid duplication. UNEP (2017), UNEP and WMO (2011), Xu et al. (2013), and Chapter 2 are refered.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
15725	29	31	29	31	Edit "fossil fuel combustion" to "fossil fuels incorrect combustion systems" [, Iran]	Corrected
7331	29	40	29	44	It is hard to understand why the examples quoted are adverse side effects when they both seem positive: "Reactive nitrogen deposition could enhance CO2 uptake in boreal forests and increase soil carbon pools to some extent (Maaroufi et al. 2015). It might also have some adverse side effects on food production, since some forms of air pollutants could actually enhance 44 crop productivity by increasing diffuse sunlight, compared to direct sunlight". [Debra Roberts, South Africa]	Revised
5697	29	45	29	46	the positive and negative effect of aerosol is mostly related to its composition not the level! [Sanaz Moghim, Iran]	Corrected
1415	29	45	29	47	References and quantification of impact from WG1-AR5 would be more relevant there. [Sophie Szopa, France]	The text is revised and references are added.
1413	29	47	29	47	ozone or black carbon would be better examples of warming pollutants rather than nitrogen oxides .. [Sophie Szopa, France]	The text is revised and references are added.
12267	29	24	30	2	There are two different processes for being discussed here under acidification - acid deposition from eg sulfuric and nitric acids in air pollutants, and aquatic acidification from uptake of CO2 by waters. Please clarify this seperation in the text [Hans Poertner and WGII TSU, Germany]	Aquatic acidification is moved to the end of this section to separate from atmospheric pollution.
7549	29	40	30	2	Reducing aerosols from the atmosphere reduces reflectivity and leads to unmasked warming. See Xu and Ramanathan (2017) Well below 2 °C: Mitigation strategies for avoiding dangerous to catastrophic climate changes, Proc. Natl. Acad. Sci., doi: 10.1073/pnas.1618481114; Ramanathan and Xu (2010) The Copenhagen Accord for limiting global warming: Criteria, constraints, and available avenues, Proc. Natl. Acad. Sci., doi: 10.1073/pnas.1002293107; Ramanathan and Feng (2008) On avoiding dangerous anthropogenic interference with the climate system: Formidable challenges ahead, Proc. Natl. Acad. Sci., doi: 10.1073/pnas.0803838105. [Durwood Zaelke, United States of America]	The interactions between aerosol and climate system are described in Chapter 2 in detail, and it is not repeated here to avoid duplication. Xu and Ramanathan (2017) and Chapter 2 are refered.
7625	29	40	30	2	Reducing aerosols from the atmosphere reduces reflectivity and leads to unmasked warming. 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. [Kristin Campbell, United States of America]	The interactions between aerosol and climate system are described in Chapter 2 in detail, and it is not repeated here to avoid duplication. Xu and Ramanathan (2017) and Chapter 2 are refered.
28679	29	2		12	I recommend table showing the rate of forest degradation and deforestation in the tropics in relation to area concentrated, areas affected and action takenny the government. Forest degradation is a big issues in the tropics. An integrated map showing the rate of forest degradation in the tropics should be included in the table. [Abiodun Adegoke, Nigeria]	This is addressed in Ch 4
28681	29	24		39	Control preventive measures, adaptive measures in the forest management, Mitigating strategy on air pollutants. Adaptive response should be stated for mitigation on air pollution to take effects. [Abiodun Adegoke, Nigeria]	Descriptions on air pollutants and short-lived climate forcers (SLCFs) are included in Chapter 2, and the quotation is added in this section.
10119	30	3	30	37	this section needs editing to correct inaccurate statements and poorly worded sentences. The heading suggests that it includes discussion on bush encroachment - a controversial phenomenon, as it involves expansion of native species - but this is not discussed. [Jean-Luc Chotte, France]	This suggestion about bush is not relevant to the chapter

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10121	30	4	30	4	?? agricultural land usually has low diversity, as do plantation forests. Natural forests have higher diversity, and are usually dominated by native species. This statement may be true for pastures dominated by introduced pasture species. [Jean-Luc Chotte, France]	Reformulated: Agricultural lands and secondary forests can be often dominated by non-native species.
18129	30	4	30	4	Agricultural and forests can be very high in diversity…Need to be re-formulated. [Vladimir Romanenkov, Russian Federation]	Reformulated: "Agricultural lands and secondary forests"
26321	30	9	30	9	shoud read: "manual clearing of invasive species" [Aaron Smith, Norway]	Text revised
26323	30	13	30	13	should read: "type, quantity, and quality" [Aaron Smith, Norway]	Text revised
7823	30	15	30	15	Conflicting the expression of reference (Brundu, Richardson, 2016) with that in line 29. [Hiroaki Kondo, Japan]	It is correct reference for line 15 and 29
15663	30	18	30	18	Why this old reference? Not newer ones confirming this? Same problem through this chapter. [Tuomo Kalliokoski, Finland]	Annual increment is not change since last publication. I can't find newer
26325	30	24	30	24	should read: "fibre, firewood, and other forest products." [Aaron Smith, Norway]	Text revised
26327	30	25	30	25	should read: "trees to maximize current" [Aaron Smith, Norway]	Text revised
26329	30	26	30	26	should read: "while minimizing present" [Aaron Smith, Norway]	Text revised
15665	30	28	30	28	Only when they become invasive? I would assume there could be negative effects already before that e.g. if plantations are made on by clearing out native forests. I also would assume land-use conflicts could be created by intorducing industrial tree species to the ares used for other purposes. [Tuomo Kalliokoski, Finland]	Cross referenced to afforestation section and afforestation cross chapter box
26331	30	30	30	30	should read: "According to the results of a meta-analysis, abundance and diversity" [Aaron Smith, Norway]	Text revised
26333	30	31	30	31	should read: "communities where invasive species were dominant" [Aaron Smith, Norway]	Text revised
25599	30	38	30	38	To be consistent with the rest of the report, this section should be merged with "Sustainable forest management and forest restoration" and with "Afforestation" into a subsection "afforestation and reforestation" by using elements from cross-chapter box 1 (1-19 - 1-22). See GENERAL COMMENT ON AFFORESTATION AND REFORESTATION. [, France]	The aggregation of forest option has been slightly change to keep consistency with other chapters
39843	30	38	30	46	It is noted that reforestation is similar to afforestation. But reforestation is also similar to what is described as "forest restoration" on page 6-24. This should be noted and also describe differences or overlap between them. As stated on page 6-24, "it could fall under restoration if it were re-establishing trees where they have been lost". On page 6-30 it states, "reforestation is conversion of land that was recently deforested to forest". [, United States of America]	The aggregation of forest option has been slightly change to keep consistency with other chapters
10123	30	38	30	46	section needs editing for accuracy and expression [Jean-Luc Chotte, France]	done
26335	30	45	30	45	should read: "desertification, land degradation, and food security" [Aaron Smith, Norway]	done
27257	30	4			SANBI Report on Invasive Species may be of interest: https://www.sanbi.org/resources/infobases/invasive-alien-plant-alert/ [, Germany]	Noted. Thanks
28683	30	39		46	Reforestation which is a conversion of land recently defrosted to forest. I recommend quick Landscape architecture expert in the urban areas where housing demand is high.The landscape protection process, environmental agency of areas affected(positely and negatively) must take measures. Government policy should be comprehensively outlined for the public and policy makers most especially in the tropics. Reforestation can help in carbon sink and carbon emissions envelopes. Therefore international community response on reforestation should take quick and close attention response. [Abiodun Adegoke, Nigeria]	landscape management is now mentioned. The importance of reforestation / restoration is clearly highlighted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39845	31	1	31	16	When discussing coastal wetlands, only flooding was addressed and not sea-level rise. This should be addressed (6.3.1.19). [, United States of America]	Revised
26337	31	3	31	3	should read: "mangroves, salt marshes, and seagrass ecosystems" [Aaron Smith, Norway]	Wording changed
10127	31	7	31	7	what is "they"? [Jean-Luc Chotte, France]	Done
2879	31	7	31	7	I think 'storm surge' is only singular. [Luca Castrucci, United States of America]	Done
26339	31	8	31	8	should read: "energy, reducing erosion, and by helping" [Aaron Smith, Norway]	Done
7155	31	11	31	11	What is meant by 'large'? Are you able to quantify this? [Debra Roberts, South Africa]	Wording changed
14333	31	12	31	16	But in coastal areas where mangroves are naturally areas of seafood production and serve as spawning grounds for many fish species, (Gilman, et al 2006) the restoration of degraded mangroves contribute to improving the food security of neighboring populations [Samba Sow, Senegal]	Wording changed
26341	31	14	31	14	should read: "leading to small adverse" [Aaron Smith, Norway]	Done
7157	31	17	31	17	The assessment in Chapter 4 noted that the benefits of biochar application differs across land type. This point should be highlighted in the discussion here. [Debra Roberts, South Africa]	Wording changed
25601	31	17	31	17	Limitations of biochar should be better highlighted. In addition, how does the biochar ensure that the C-N-P ratios required for plant growth are respected? Cf. GENERAL COMMENT ON BIOCHAR A reference to use: - Kavitha, B., Reddy, P. V. L., Kim, B., Lee, S. S., Pandey, S. K., & Kim, K. H. (2018). Benefits and limitations of biochar amendment in agricultural soils: A review. Journal of environmental management, 227, 146-154. [, France]	Limitations now added
25747	31	17	31	19	biochar global production can be improved including ocean cultivation as biomass source and advanced biorefineries using renewable hydrogen, see comment 4 on page 25, bunker fuel suitable for short term niche in both cases [Roque Pedace, Argentina]	This feedstock noted
21283	31	17	31	34	The negative impacts of biochar application on soil and land degradation are not considered. I suggest considering https://doi.org/10.1111/gcbb.12037 https://doi.org/10.1016/j.envint.2015.10.018 https://doi.org/10.1111/gcbb.12007 [, United Kingdom (of Great Britain and Northern Ireland)]	Limitations now added
39847	31	17	31	34	The uncertainties around the long-term impacts of biochar application do not seem adequately addressed in this section. [, United States of America]	Limitations now added
10129	31	18	31	18	not a by-product - biochar is the main product of slow pyrolysis [Jean-Luc Chotte, France]	Wording changed
14283	31	18	31	19	Bioenergy is not a soil amendment. This sentence is poorly constructed and misleading. "Biochar is the solid product of biomass pyrolysis" is a better (and simpler) definition. The paragraph would benefit from separating these conflated sentences into separate ones that deal with 1. the definition of biochar 2. The various impacts of adding biochar to soil [Lukas Van Zwieten, Australia]	Wording changed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14285	31	19	31	19	One reference is inadequate; Impact on water holding capacity varies with soil type (especially texture). See for example the apper by Quin Quin PR, Cowie AL, Flavel RJ, MacDonald LM, Morris SG, Keen B, Singh B-P, Young IM, Van Zwieten L* (2014) Biochar changes soil structure and water-holding capacity - a study with x-ray µCT. Agriculture Ecosystems Environment 191, 142–149. [Lukas Van Zwieten, Australia]	Wording changed
26343	31	20	31	21	should read: "(so can form part of cropland, grazing land, and forest management; Smith 2016) [Aaron Smith, Norway]	Wording changed
6095	31	21	31	21	It would be good to revise the sentence, such as the editorial correction with: (Smith, 2016) [, Poland]	Wording changed
7825	31	21	31	21	management Smith 2016 --> management; Smith 2016: Is this Simth 2016a or 2016b? [Hiroaki Kondo, Japan]	Wording changed
39849	31	22	31	23	Text reads: "Use of biochar as a soil amendment can provide significant mitigation by creating soil carbon sinks (Smith 2016), and ..." Highly questionably. See Gurwick et al. 2013 PLOS ONE. If there is a better systematic review published since, cite that. A 2015 NAS report echoed the limited evidence base for evaluating biochar as a mitigation strategy. The many claimed benefits generally do not have strong support in the research literature especially with respect to in-situ studies. That limitation in evidence should be made extremely clear. [, United States of America]	Wording changed
10131	31	22	31	23	Production and use of biochar as a soil amendment is a carbon dioxide removal option - it is incorrect to call it a soil carbon sink. Sink is a process that removes CO2 from the atmosphere. Pyrolysis stabilises biomass - biochar is a recalcitrant material - greatly slowing the oxidation rate. This important aspect has not been mentioned. Soil application ensures that biochar carbon stays out of the atmosphere - eg is not used for fuel. It is the whole system of growing plants and making biochar and applying it to soil that is the sink. [Jean-Luc Chotte, France]	Wording changed
26345	31	28	31	28	should read: "There may be, on balance, benefits" [Aaron Smith, Norway]	Wording changed
10125	31	33	31	33	increased land competition due to the land requirements for biomass feedstock is here classified as 'few adverse impacts other than …'. This is not in balance with the way increased land competition is classified with other options and the impacts of the additional land requirements for biochar may be high and impact across the different land challenges. This needs to be indicated and phrasing needs to be modified. [Jean-Luc Chotte, France]	Wording changed
14293	31	33	31	34	As mentioned in comment on line 31, there is considerable potential using only non-competitive feedstocks and non-competitve land use such as degraded abandoned land and agroforestry. [Lukas Van Zwieten, Australia]	Wording changed
25109	31	35	31	49	Xu et al. (2018) made the first attempts to identify the hotspots of peatland-derived potable water use on a global scale. It was also found that 72% of water-supply peatland is suffered from certain level of degradation, implying the importance of peatland restoration . Xu J., Morris P. J., Liu J., Holden J., 2018. Hotspots of peatland-derived potable water use identified by global analysis. Nature Sustainability 1, 246-253. [Junguo Liu, China]	This has been consulted
21285	31	39	31	40	It is more than a temporary increase in CH4 emissions - see https://doi.org/10.5194/bg-12-4361-2015 . Suggest deleting 'temporary'. [, United Kingdom (of Great Britain and Northern Ireland)]	Done
15667	31	40	31	40	Ojanen and Minkkinen refs [Tuomo Kalliokoski, Finland]	Not found

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21287	31	41	31	43	There is no need to mention that restoring degraded peat won't help with desertification. This is obvious. Please delete to reduce chapter length. [, United Kingdom (of Great Britain and Northern Ireland)]	Done
26347	31	42	31	42	should read: "no benefits" not in bold text no italics [Aaron Smith, Norway]	Done
7827	31	42	31	42	"no benefits" : It may not be written in bold type. [Hiroaki Kondo, Japan]	Done
39851	31	42	31	43	Agreed that peatland restoration is unlikely to influence desertification, but is that really a surprise to anybody? Is it really a contribution to put something so obvious into this report? [, United States of America]	Done
39853	31	44	31	45	Need more clarity on what degradation means in this context and what types of restoration would address it. [, United States of America]	Done
7159	31	45	31	49	The impact on the livelihood of dependent communities should be highlighted. [Debra Roberts, South Africa]	Done
40803	31		31		lots of repetitions in various chapters on reforestation, biochar, etc. Hard for the reader to have a sense of the key findings through chapters and convey in ES/SPM. [Valerie Masson-Delmotte, France]	Now better cross referencing
8335	31	17	34		The evidence for the claim that Biochar has positive effects on yields is missing, in an extensive review it is shows that Biochar only has positive effects in tropical soils (Jeffrey et al 2018), most likely from its strong alkaline nature and reduction of acidity (Verheyen et al. 2009) and hence improved P availability on acid soils. This means that positive effects are also short-term, as then soil pools of P will be mined quicker and production will drop again. [Antonius Schut, Netherlands]	Limitations now added
8337	31	17	34		Jeffery, S., D. Abalos, M. Prodana, A. C. Bastos, J. W. Van Groenigen, B. A. Hungate and F. Verheijen (2017). "Biochar boosts tropical but not temperate crop yields." Environmental Research Letters 12(5). [Antonius Schut, Netherlands]	This has been added
8339	31	17	34		Biochar Application to Soils [Antonius Schut, Netherlands]	Wording changed
8341	31	17	34		Verheijen, F.G.A., Jeffery, S., Bastos, A.C., van der Velde, M., and Diafas, I. (2009). Biochar Application to Soils - A Critical Scientific Review of Effects on Soil Properties, Processes and Functions. EUR 24099 EN, Office for the Official Publications of the European Communities, Luxembourg, 149pp. Available from: https://www.researchgate.net/publication/258842182_Biochar_Application_to_Soils_-_A_Critical_Scientific_Review_of_Effects_on_Soil_Properties_Processes_and_Functions [accessed Jan 13 2019]. [Antonius Schut, Netherlands]	This has been consulted
14287	31	23			Mitigation potential in Smith 2016 is based on Woolf et al 2010. Primary rather than secondary derivative references should be used. [Lukas Van Zwieten, Australia]	Wording changed
14289	31	31			This point is central and needs to be dealt with much more fully than this single short statement, which misses important aspects. The source of biomass is key to sustainability of biochar systems. Woolf et al 2010 showed that the potential for biochar is nonetheless substantial -- even when strict sustainability constraints are applied to preclude negative impacts on food security. This needs to be mentioned. Although it is also true that conflicts with food security could arise if these sustainable practices are not adhered to, this needs to be qualified with both a statement about the large sustainable potential, and also the need for sustainability protocols that avert such conflicts. [Lukas Van Zwieten, Australia]	Wording changed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22805	31	33			increased land competition due to the land requirements for biomass feedstock is here classified as 'few adverse impacts other than …'. This is not in balance with the way increased land competition is classified with other options and the impacts of the additional land requirements for biochar may be high and impact across the different land challenges. This needs to be indicated and phrasing needs to be modified. [Anastasios Kentarchos, Belgium]	Wording changed
14291	31	33			re "few adverse impacts": Section 6.3.1.25 on bioenergy and BECCS explicitly mentions the potential benefits of growing appropriate plant species on marginal lands to improve ecosystems. The same is also true if biomass is grown on marginal lands for biochar feedstock, so should also be mentioned here, to not bias the discussion. [Lukas Van Zwieten, Australia]	Wording changed
10133	32	2	32	2	establishing trees - also includes sowing seed (or encouraging forest regeneration though this is not likely for sites that have not recently been forested - ie applied to reforestation rather than afforestation) [Jean-Luc Chotte, France]	Definition given in the glossary are used
39855	32	2	32	3	Isn't it possible to afforest non-forested land that isn't agricultural lands that haven't previously been forested? Rangeland, grassland? This seems to be a narrow scope. [, United States of America]	Changed in the text
15669	32	6	32	14	BVOCs and their effect on SOA and thus cloud albedo missing here. [Tuomo Kalliokoski, Finland]	BVOC added on page 6-177
10135	32	12	32	12	"higher latitude" than the tropics could be interpreted as anywhere north/south of the tropics - including subtropics. This applies only where there is snow cover. Reword as: at high latitudes and in other areas affected by seasonal snow cover… [Jean-Luc Chotte, France]	Changed
26349	32	15	32	16	should read: "(Findell et al., 2017; Lejeune et al.,2018)" [Aaron Smith, Norway]	Changed
39857	32	21	32	22	Suggest 'can be' instead of 'are' before 'large adverse...' [, United States of America]	Changed in the text
7161	32	21	32	28	The gender dimension of the negative impacts of afforestation programme should be pointed out here in addition to its impact on the livelihood of the entire population dependent on the afforested land. [Debra Roberts, South Africa]	This is an aspect related to gender equality, and discussed in the specific section where each response options is assessed against contributions to the different SDGs
31761	32	35	32	49	An alternative to restoring degraded peatlands which have been used for intensive agriculture e.g. by ploughing and draining for many years may be develop ways of managing them more sustainably as agricultural land e.g. maintain a high water table and avoiding bare ground or introducing paludiculture, so carbon losses can be minimised or stopped whilst maintaining production. There are some initiatives of this sort in the Fens of East Anglia, UK. [Mike Morecroft, United Kingdom (of Great Britain and Northern Ireland)]	Now noted
26351	32	36	32	36	should read: "yr-1 – indicating that preventing" [Aaron Smith, Norway]	Done
7163	32	36	32	36	Rather consider providing the actual amount since 'significant' could be interpreted to mean anything. [Debra Roberts, South Africa]	Wording changed
26353	32	40	32	40	should read: "by stabilizing soils" [Aaron Smith, Norway]	Done
10137	32	40	32	42	desertification is LD in the drylands (NB not just arid), but we often refer to land degradation and desertification. So you can just say prevention or reversal of land degradation and desertification (Ch3, Ch 4) [Jean-Luc Chotte, France]	Corrected
7165	32	42	32	45	Add impact on the livelihood of dependent communities. [Debra Roberts, South Africa]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6217	32	46	33	10	In this section, a sentence should be added on the energy source for grounding the rock, either fossil fuel or clean energy, which would impact on its effectiveness of CO2 removal [Weimu Xu, Ireland]	Done
7829	33	1	33	1	((-->([Hiroaki Kondo, Japan]	Done
5699	33	8	33	10	needs references [Sanaz Moghim, Iran]	Done
10139	33	9	33	9	The section on 'enhanced weathering of minerals' is too positive and tradeoffs are classified in a subjective manner. Grinding of rocks is incredibly energy consuming (leading to tradoffs on mitigation) and the same holds for the mining itself. Although the area of mining is 'small' as compared to agriculture the impacts of mining are disastrous and affect larger areas. Transport of this material is also heavily emission intensive. This is all not mentioned and not accounted for. These tradeoffs need to be indicated and a fair jusdgement of the potential needs to be made. [Jean-Luc Chotte, France]	Reworded
39861	33	12	33	13	Bioenergy incentives can in some instances also promote forest carbon sequestration as increased and related prices make keeping lands in forestry more lucrative. See, e.g., the global land use model in Tian et al. 2018 (Land Economics. 94(1): 97-113.) [, United States of America]	We have added this information and this citation
7551	33	12	33	20	BECCS is not carbon neutral in the critical near-term. Furthermore, whether BECCS is effective will depend a great deal on the type of bioenergy being used. Using biomass for energy from wood is considerably worse than coal in the near-term. See Danielle Venton, Core Concept: Can bioenergy with carbon capture and storage make an impact?, PNAS (2016); Mary S. Booth, Not carbon neutral: Assessing the net emissions impact of residues burned for bioenergy, ENVIRON. RES. LETT. 13 (21 February 2018); 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.”). See, also Duncan Brack, Wood Is Not a Carbon-Neutral Energy Source (1 March 2017). [Durwood Zaelke, United States of America]	This is covered in detail in Chapter 2. We've added a note referring the reader to that discussion. We've also added a cross-chapter box on bioenergy that indicates where different aspects of bioenergy are discussed in this report.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7627	33	12	33	20	Whether BECCS is effective will depend a great deal on the type of bioenergy being used. Using biomass for energy from wood is considerably worse than coal in the near-term. See, e.g., Duncan Brack, Wood Is Not a Carbon-Neutral Energy Source (1 March 2017). Using switchgrass could lead to net carbon removal. See Danielle Venton, Core Concept: Can bioenergy with carbon capture and storage make an impact?, PNAS (2016); 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. [Kristin Campbell, United States of America]	We have included the dependence on feedstock in the text. We are also referring the reader to Chapter 2 and the new cross-chapter box on bioenergy for a discussion of these effects.
10141	33	14	33	14	largest future potential deployment'. Avoid this highly subjective language and judgement before the full analysis of this option. Given the large needs for additional area and the incredible tradeoffs (and simple unavailabilty of such area) it is impossible to rate this as 'largest future potential deployment'. At most it can be said that in some SSP scenarios a high potential is assigned to this option (which is very unfortunate given the huge tradeoffs and the fact that the technology is not even ready). [Jean-Luc Chotte, France]	We have rephrased this sentence.
10145	33	16	33	16	biofuels, not bioliquids [Jean-Luc Chotte, France]	We have corrected this
10147	33	19	33	20	not much on this in chapter 7 [Jean-Luc Chotte, France]	We have expanded the discussion of barriers in Section 6.5
22811	33	21	33	26	The report needs to find a single place for balanced discussion of different aspects of large-scale, land-based mitigation, inc BECCS, bringing together the important caveats stated in this section, together with the key messages from numerous similar sections elsewhere in the report. This will facilitate providing balanced key messages in the SPM. [Anastasios Kentarchos, Belgium]	We have added a cross-chapter box on bioenergy.
39863	33	21	33	26	It is stated briefly in the previous paragraph (lines 12-20) but it should be reiterated that, while bioenergy and BECCS are widely deployed in many future scenarios as climate change mitigation options, this technology has not yet been proven, put to scale, and is entirely dependent on CCS being able to go to scale/cost-effective. Give this more emphasis. [, United States of America]	We now have a discussion of barriers to bioenergy and BECCS, including scale/cost-effectiveness in Section 6.5
5397	33	21	33	26	While the statement is correct, I think it is necessary to stress that there is literature suggesting that even 1.5 degree can be reached without NET/BECCS, e.g. Grubler, A., et al. 2018. A low energy demand scenario for meeting the 1.5 °C target and sustainable development goals without negative emission technologies. Nature Energy 3, 515. https://doi.org/10.1038/s41560-018-0172-6 if a demand-side strategy is adopted. See also Cullen, J.M., et al. 2011. Reducing Energy Demand: What Are the Practical Limits? Environ. Sci. Technol. 45, 1711–1718. https://doi.org/10.1021/es102641n [Helmut Haberl, Austria]	We discuss the Grubler et al scenario specifically in Section 6.5. Note that the scenario there does include bioenergy, just not BECCS, so we have left the statement in this section as is.
26355	33	22	33	22	should read: "(Edenhofer et al. 2011; Chum et al. 2011" [Aaron Smith, Norway]	We have corrected this
40335	33	27	33	27	not all energy crops for bioenergy production compete for water. Some, like sugarcane, is depended on rain.. [Thelma Krug, Brazil]	We have added this caveat
5399	33	27	33	35	Adoption of diets with less animal products can reduce land demand of food production which might leave more land available for BECCS respectively reduce pressure on forests. See e.g. Erb, K.-H., et al., 2016. Exploring the biophysical option space for feeding the world without deforestation. Nat Commun 7, 11382. https://doi.org/10.1038/ncomms11382 [Helmut Haberl, Austria]	We have added a note that the implications of bioenergy and BECCS also depend on which other response options are included and referred the reader to a discussion on interlinkages in Section 6.5.4.2, where this is included in detail.
25749	33	27	33	35	land requirement can be overcome by desalting and ocean cultivation , see comments 2 , 4 and 5 .Comment 6 relevant for improving bioenergy from biochar and advanced biorefineries. [Roque Pedace, Argentina]	We've added a reference on algal biomass

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26357	33	30	33	30	should read: "Hejazi et al. 2015b). Bioenergy" [Aaron Smith, Norway]	We have corrected this
10149	33	41	33	47	Mention also that biomass production can be integrated with conventional agricultural systems, reducing land competition, and in some case enhancing ag productivity, reducing off-site impacts (such as eutrophication) and increasing resilience of farming systems. [Jean-Luc Chotte, France]	We have clarified that bioenergy "can" compete for land, and emphasized that this is dependent on scale, feedstock, etc.
10143	33	44	33	44	improve many indicators'. This is correct on degraded lands. However, it is common that these crops replace (semi-) natural vegatation that is often better at such restoration. See the wide literature on ecosystem restoration for evidence. [Jean-Luc Chotte, France]	We have added a note that this refers to degraded land
39859	33	11	34	8	Suggest adding that, in some instances, synergies exist between land-based mitigation options. For example, implementing forest carbon mitigation and bioenergy policies concurrently can create greater benefits, particularly in the near term, than when implemented in isolation. This finding is based on recent literature: Baker et al. (2019). Potential complementarity between forest carbon sequestration incentives and biomass energy expansion. Energy Policy. 126. 391-401. 10.1016/j.enpol.2018.10.009. https://www.sciencedirect.com/science/article/pii/S030142151830661X Another example is Favero et al. (Climatic Change, 2017), which focuses on interaction between BECCS and forest carbon policies. [, United States of America]	We have added this information and both the Baker and Favero citations to both Section 6.3 and Section 6.5.
7391	33	11	34	8	What we need here is an exhaoustive critique of what is missing from current assessments about land constraints along the lines suggested in the above comments. [Stephen Pacala, United States of America]	We have added more information on what is and isn't included in assessments in Section 6.5.4
27259	33	15	34	8	Please mention that BECCS is considered a CDR technology. The current description lacks this context. Please mention also the biodiversity risks from BE and BECCS if deployed at large scale. [, Germany]	We have added that BECCS is a CDR technology. We have added biodiversity to the list of potential interlinkages in this section, but a more complete discussion on bioenergy and biodiversity is in Section 6.5
22807	33	9			The section on 'enhanced weathering of minerals' is too positive and tradeoffs are classified in a subjective manner. Grounding of rocks is incredibly energy consuming (leading to tradoffs on mitigation) and the same holds for the mining itself. Although the area of mining is 'small' as compared to agriculture the impacts of mining are disastrous and affect larger areas. Transport of this material is also heavily emission intensive. This is all not mentioned and not accounted for. These tradeoffs need to be indicated and a fair jusdgement of the potential needs to be made. [Anastasios Kentarchos, Belgium]	Reworded
22809	33	14			largest future potential deployment'. Avoid this highly subjective language and judgement before the full analysis of this option. Given the large needs for additional area and the incredible tradeoffs (and simple unavailabilty of such area) it is impossible to rate this as 'largest future potential deployment'. At most it can be said that in some SSP scenarios a high potential is assigned to this option (which is very unfortunate given the huge tradeoffs and the fact that the technology is not even ready). [Anastasios Kentarchos, Belgium]	We have rephrased this sentence.
22813	33	44			improve many indicators'. This is correct on degraded lands. However, it is common that these crops replace (semi-) natural vegatation that is often better at such restoration. See the wide literature on ecosystem restoration for evidence. [Anastasios Kentarchos, Belgium]	We have added a note that this refers to degraded land

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7553	34	1	34	8	BECCS is not carbon neutral in the critical near-term. Furthermore, whether BECCS is effective will depend a great deal on the type of bioenergy being used. Using biomass for energy (BE) from wood is considerably worse than coal in the near-term. See Danielle Venton, Core Concept: Can bioenergy with carbon capture and storage make an impact?, PNAS (2016); Mary S. Booth, Not carbon neutral: Assessing the net emissions impact of residues burned for bioenergy, ENVIRON. RES. LETT. 13 (21 February 2018); 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."). See, also Duncan Brack, Wood Is Not a Carbon-Neutral Energy Source (1 March 2017). [Durwood Zaelke, United States of America]	Duplicated Comment
7629	34	1	34	8	Whether BECCS is effective will depend a great deal on the type of bioenergy being used. Using biomass for energy (BE) from wood is considerably worse than coal in the near-term. See, e.g., Duncan Brack, Wood Is Not a Carbon-Neutral Energy Source (1 March 2017). Using switchgrass could lead to net carbon removal. See Danielle Venton, Core Concept: Can bioenergy with carbon capture and storage make an impact?, PNAS (2016); 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. [Kristin Campbell, United States of America]	Duplicated Comment
31781	34	5	34	6	Additional reference on the use of forest residues as feedstock : Patrizio et al. (2018). Joule, 2(12), 2633–2648. [Piera Patrizio, Austria]	We have added this reference to the table section 6.5.4.2 where future scenarios are discussed, as this specific sentence was about land implications of residues.
15671	34	6	34	6	ncreased use of woody bioenergy decreases the carbon stock of forests and due to low substitution carbon payback time can be from decades to centuries. Please see refs like Ter-Mikaelin et al. 2015, Searchinger et al., Soimakallio et al. 2016 [Tuomo Kalliokoski, Finland]	We have added a reference to Chapter 2 and the new Cross-Chapter Box on Bioenergy where the carbon effects of bioenergy are discussed.
32659	34	6	34	8	It is not only that "additional forest needed for woody bioenergy could compete with farmland", it is also that "supplying high levels of bioenergy will probably require expanding harvests in forests all over the world" (See, e.g. Searchinger et al., 2018, Nature Communications, DOI: 10.1038/s41467-018-06175-4) [Jean-Pascal van Ypersele, Belgium]	We have added this caveat and reference
39865	34	8	34	8	What about the effect of perverse incentives on forests for bioenergy/BECCS needs? [, United States of America]	We have added that bioenergy/BECCS can lead to significant deforestation. We discuss incentives in Section 6.5
10151	34	8	34	8	in addition the feedstock can lead to serious forest degradation. Furthermore, the use of agricultural residues may compete/tradeoffs with soil organic matter management [Jean-Luc Chotte, France]	Duplicated Comment

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39867	34	9	34	48	Would help to distinguish more clearly among different types of meat (ruminants vs. non, e.g.) and also to group beef and cow-based dairy, as dairy produces GHG emissions comparable to beef. These points could be amplified in the Executive Summary, particularly calling attention to the fact that dietary change and reduced food loss and waste could both reduce GHG emissions much more than most supply-side measures in the food system can but also can relieve a great deal of pressure on land, freeing it up for many of the currently competing uses because of the very large amount of land currently used for grazing. [, United States of America]	Now nuances by livestock product type
567	34	10	34	10	see chapter 5 section 5,5,2 [Nathalie Hilmi, France]	Cross reference added
22817	34	10	34	28	Dietary change is as an option only framed as 'healty diets' while this is rather a synergy of the option rather than the option itself. For other options health benefits are mentioned as a synergy, here it seems to be part of the option. It is better to identify the option as dietary change (more vegatable/low meat dietas) and mention the health benefits as a synergy, where appropriate (as many healthy food chices are bad for the climate). Moreover, the range of options should be better indicated, from nationally recommended (health-based) to vegetarian and vegan diets. There is a wide literature on this beyond the small number of IAM based studies that needs to be accounted for, e.g. doi: 10.1016/j.gloenvcha.2015.08.011; doi:10.1016/S2542-5196(18)30206-7; doi:10.1007/s11367-015-0923-6; doi:10.1016/j.agsy.2017.01.014. This literature also provides numbers that deviate sometimes a lot from the numbers presented in the tables. These ranges (and underlying causes of the differences) should be explained. [Anastasios Kentarchos, Belgium]	Wording changed
10153	34	10	34	28	Dietary change is as an option only framed as 'healty diets' while this is rather a synergy of the option rather than the option itself. For other options health benefits are mentioned as a synergy, here it seems to be part of the option. It is better to identify the option as dietary change (more vegatable/low meat dietas) and mention the health benefits as a synergy. Moreover, the range of options should be better indicated, from nationally recommended (health-based) to vegetarian and vegan diets. There is a wide literature on this beyond the small number of IAM based studies that needs to be accounted for, e.g. doi: 10.1016/j.gloenvcha.2015.08.011; doi:10.1016/S2542-5196(18)30206-7; doi:10.1007/s11367-015-0923-6; doi:10.1016/j.agsy.2017.01.014. This literature also provides numbers that deviate sometimes a lot from the numbers presented in the tables. These ranges (and underlying causes of the differences) should be explained. [Jean-Luc Chotte, France]	Wording changed
27261	34	11	34	18	What is the message of this paragraph? It seems obvious that those eating too much should eat less while those in hunger should eat more. But how would this „contract and converge“ be implemented? Please amend. [, Germany]	Implementation through policies - see chapters 5 and 7
26359	34	17	34	17	should read: "Aleksandrowicz et al. 2016; Tilman" [Aaron Smith, Norway]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10157	34	19	34	23	Note however that ruminant livestock produce high-nutritional value food in landscapes that cannot be used for crop production (non-arable due to slope or fragile soils, low rainfall environments). Furthermore, livestock can be important components of mixed farming systems, reducing the need for chemicals, creating value from pastures planted in rotation to enhance productivity and organic matter levels to sustain cropping. In the rangelands, grazing livestock can be an important component of landscape management. Therefore it is important to distinguish between livestock systems that are based on ruminants that are housed and fed on grain, and those raised predominantly on pasture. [Jean-Luc Chotte, France]	Wording changed
7167	34	19	34	28	Consider providing scenario(s) and possible quantitative benefits associated with it. [Debra Roberts, South Africa]	For consistency with other options, the quantitative benefits are discussed in Section 6.4 and scenarios are discussed in Section 6.5 (as well as Chapters 2 and 5)
26361	34	20	34	20	should read: "Havlík et al.,2014)," [Aaron Smith, Norway]	Done
26363	34	22	34	22	should read: "(Stehfest et al. 2009), and" [Aaron Smith, Norway]	Done
21289	34	23	34	23	"increase bioenergy potential" - this is true. However, please consider presenting an alternate (or perhaps complimentary) framing - that dietary change leading to reduced consumption can avoid the need, to some extent, for bioenergy/beccs. This is observed in low energy demand pathways, such as https://www.nature.com/articles/s41560-018-0172-6 [, United Kingdom (of Great Britain and Northern Ireland)]	We have added this note and a link to section 6.5.4.2 where this paper (and others that make similar points) are discussed.
26365	34	27	34	27	should read: "of fertilizer (nitrogen" [Aaron Smith, Norway]	Done
10155	34	28	34	28	The large co-benefit of 'saving land' and reducing land competition for biodiversity is not mentioned. Reduced competition for land is probably by far the largest co-benefit (which also extents to many of the SDGs) [Jean-Luc Chotte, France]	Now added
26367	34	31	34	31	should read: "food losses can improve" [Aaron Smith, Norway]	Reworded
39869	34	31	34	31	Remove "has" between "losses" and "can". [, United States of America]	Reworded
1937	34	31	34	31	I suggest remove “has”. [William Lahoz, Norway]	Reworded
26369	34	33	34	33	should read: "post-production" [Aaron Smith, Norway]	Reworded
26371	34	34	34	34	should read: "(Bradford et al. 2018; Gustavsson et al. 2011)." [Aaron Smith, Norway]	Reworded
7831	34	34	34	34	2018) --> 2018; [Hiroaki Kondo, Japan]	Done
26191	34	39	34	39	After "infrastructure deficiencies," insert: "such as the lack of reliable energy supplies" [Reid Detchon, United States of America]	Reworded
26373	34	40	34	40	should read: "preserve, and where appropriate," [Aaron Smith, Norway]	Reworded
32617	34	40	34	42	nice you differentiate here among technologies to avoid food waste which are valid for different production systems [Marta Guadalupe Rivera-Ferre, Spain]	Thank you
10159	34	44	34	45	this list is hard to follow - hard to understand and distinguish the different options. Are these the small-scale options? [Jean-Luc Chotte, France]	Text removed - section reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25111	34	29	35	22	Add the following sentences. Liu et al. (2013) provide a comprehensive review on available information concerning China' s food losses and waste. The results show that the food loss rate (FLR) of grains in the entire supply chain is 19.0% ±5.8% in China, with the consumer segment having the single largest portion of food waste of 7.3% ±4.8%. Such a loss rate is much lower than many other developed countries. Nevertheless, there is an urgent need for dialogue between actors in the supply chain, from farmer to the consumer, on strategies to reduce the high rates of food losses and waste and thereby make a more worthwhile use of scarce natural resources. Liu J., Lundqvist J., Weinberg J., Gustafsson J., 2013. Food losses and waste in China and their implication for water and land. Environmental Science & Technology 47(18): 10137-10144. [Junguo Liu, China]	Reference consulted and added
27265	34	33	35	14	How do the approximately 1/3 number on 3-33 compare to the approximately 30 % on p 35-14? Please clarify. [, Germany]	One third (33.33%) is approximately 30%
7833	34	43	35	7	To improve infrastructure such as transportation and cold chain increases energy requirement. So, reducing post-harvest loss may include adverse effect for mitigation. [Hiroaki Kondo, Japan]	Agreed - reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30563	34	9	38	20	This entire section on value chain management appears to ommit major policy options for positive transformative change in support of climate protection, SLM and protection of human rights. It is suggested, again, that this analysis in the IPCC report should include an addtional and essential element on improved value chain regulation. As already noted and acknowledged in a few places in this second order draft, voluntary industry standards for supply chain management have not resulted in major change. Many value chain actors, including laggard companies and illegal operators, lie outside these schemes intended to promote sustainable commodity trade. At the same time, existing compliance and verification systems for voluntary commodity standards like the RSPO, FSC etc are weak or contain major accountability or conflict of interest loopholes resulting in poor implementation in production units located in local land management systems (see, for example, Colchester M and Chao S (Eds)(2013) Conflict or Consent? The palm oil sector at a crossroads FPP and Transformasi Untuk Keadilan INDONESIA http://www.forestpeoples.org/sites/fpp/files/publication/2013/11/conflict-or-consentenglishlowres.pdf Given these shortcomings, scientists, the public in consumer and producer countries as well as local rights holders impacted by global value chains, all recommend a policy mix is used to include greater use of binding and statutory regulation of global trade, supply chains, exports and imports to prohibit trade in goods linked to illegal land clearance, illegal land acquisitions, violation of tenure rights, human rights abuse and harm to the climate and the environment. See, for example van der Vena H, Rothackerb C and Cashoreb B (2018) “Do eco-labels prevent deforestation? Lessons from non-state market driven governance in the soy, palm oil, and cocoa sectors” Global Environmental Change 52(2018): 141-151. See especially Lambin E F et al (2018) “The role of supply-chain initiatives in reducing deforestation” Nature Climate Change 8 (February 2018):109-116. At the same time as ensuring increases statutory regulation, it is essential that corporate actors, financiers and investors, improve their own systems for value chain risk assessment and due diligence for their value chains and investments to prevent land grabbing, illegal land clearance, rights abuse and harmful GHG emissions [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	While this comment is useful, an assessment of the effectiveness of policy options is beyond the scope of this chapter. Chapter 7 presents a more comprehensive assessment of the potental of management and policy responses to deliver transformative change. The references suggested [van der Vena H, Rothackerb C and Cashoreb B (2018) “Do eco-labels prevent deforestation? Lessons from non-state market driven governance in the soy, palm oil, and cocoa sectors” Global Environmental Change 52(2018): 141-151. See especially Lambin E F et al (2018) “The role of supply-chain initiatives in reducing eforestation” Nature Climate Change 8 (February 2018):109-116.] were evaluated.
22815	34	8			in addition the feedstock can lead to serious forest degradation. Furthermore, the use of agricultural residues may compete/tradeoffs with soil organic matter management [Anastasios Kentarchos, Belgium]	We've added this note
21569	34	9			My sense is that at least for the mitigation side, overarching demand management is critical for most value chain solutions to achieve mitigation outcomes. If the authors agree based on their assessment, it would be useful to bring this out more clearly - a lot of initiatives focus on improving value chains and claim that this also serves climate change outcomes, but without a lot of evidence as far as mitigation is concerned because the broader policy framework necessary is often missing. So some clarification of what is needed to value chain management to achieve climate change mitigation would be helpful. [Andy Reisinger, New Zealand]	This aspect added
12269	34	9			Little or no application of uncertainty language in this section, please use for key findings [Hans Poertner and WGII TSU, Germany]	This section decribes the practices - section 6.4 quantifies and has the uncertainty language
27263	34	19			"can reduce"? Is there any doubt? If not, then please write „will reduce“ [, Germany]	Wording changed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22819	34	28			The large co-benefit of 'saving land' and reducing land competition for biodiversity is not mentioned. Reduced competition for land is probably by far the largest co-benefit (which also extents to many of the SDGs) [Anastasios Kentarchos, Belgium]	Now added
29417	34	35			Kumar & Kalita (2017) estimates that most of these losses are due to poor storage management. - This seems questionable to me, although I'm not familiar with the quoted study. Perhaps that might be the case for developing countries, therefore it should be moved a bit later in text, with other drivers (perhaps as part of infrastructure deficiencies?). [Bojana Bajzelj, United Kingdom (of Great Britain and Northern Ireland)]	Reworded
29415	34	36			Gustavsson et al. 2011 is a better (original) reference than Bajzelj 2014 here. [Bojana Bajzelj, United Kingdom (of Great Britain and Northern Ireland)]	Both provided
10163	35	2	35	2	households at the production or consumption end of the supply chain? As you've said, the major losses in developing countries occur during post-harvest storage and distribution, prior to reaching the consumer. So presumably this refers to the smallholder households? Please clarify. [Jean-Luc Chotte, France]	We have clarified this
10165	35	6	35	7	explain how. Are you referring to avoiding the whole supply chain emissions of wasted food, if it is no longer produced? Or do you mean methane emissions from food waste in landfill? [Jean-Luc Chotte, France]	Section rewritten
10167	35	8	35	8	reword for accuracy [Jean-Luc Chotte, France]	Section rewritten
26375	35	8	35	9	should read: "Ingram et al., 2016 estimated" [Aaron Smith, Norway]	Section rewritten
12969	35	11	35	11	There is no agreed conversion to generate GtCO2-eq yr-1. For instance the methane metrics in IPCC AR5 WG 1table 8.7 vary by a factor of 20. It would be more scientifically accurate if CO2, methane and N2O mitigation were quoted separately, rather than aggregating them in the controversial (and undefined in the report) CO2eq. [William Collins, United Kingdom (of Great Britain and Northern Ireland)]	We report the values as given in the literature and do not do equivalence conversions here.
26377	35	19	35	19	should read: "of fertilizer (nitrogen" [Aaron Smith, Norway]	We are using British English spellings in this report
26379	35	27	35	28	should read: "Hertel 2015)" [Aaron Smith, Norway]	We have corrected this
10169	35	28	35	28	extensification could be understood as the opposite of intensification. ie reducing intensity of production. Reducing intensity is indicated to be a desirable approach. Not clear what compensatory extensification means. Perhaps it is cropland expansion, a term used elsewhere in the chapter? If so, please use the latter term, which cannot be misinterpreted. [Jean-Luc Chotte, France]	Wording changed from compensatory extensification to 'cropland expansion'
26381	35	29	35	29	should read: "(Chapter 2; Section 6.4; Bajželj et al. 2014)" [Aaron Smith, Norway]	Corrected
26383	35	29	35	29	should read: "in pre- and post-harvesting" [Aaron Smith, Norway]	Corrected
7835	35	29	35	29	;) -->; [Hiroaki Kondo, Japan]	Corrected
26385	35	31	35	31	should read: "(Ingram et al. include year; James and James 2010)" [Aaron Smith, Norway]	Corrected
26387	35	36	35	36	should read: "markets, thereby" [Aaron Smith, Norway]	Corrected
10171	35	37	35	38	Briefly indicate the logic here. There is no explanation in section 6.4. [Jean-Luc Chotte, France]	Edited to remove sentence
26389	35	43	35	43	should read: "(Chapter 3; Section 6.4; Clark et al., 2017)." [Aaron Smith, Norway]	Corrected
7837	35	43	35	43	Section 6.4; (Clark-->Section 6.4; Clark [Hiroaki Kondo, Japan]	Corrected
26391	35	46	35	46	should read: "Additionally, globalized" [Aaron Smith, Norway]	OK

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21291	35	44	36	13	Would an additional option for increasing the stability of food supply to be the diversification of supply i.e. relying less on a relatively narrow range of crop types, produced ina relatively small number of specific locations? If yes, could this option be considered and added to the text please. [, United Kingdom (of Great Britain and Northern Ireland)]	Yes, noted, although most of the discussion of diversification is in the other response option on 'livelihood diversification'
10173	35	44	36	13	not clear how this is a response option, in your definition. Seems to be a package of policy approaches and institutional change. [Jean-Luc Chotte, France]	This response option has been merged and now called management of supply chains to incompass multiple things.
26393	35	48	36	1	should read: "Africa (Wodon and Zaman 2010" [Aaron Smith, Norway]	OK
8727	35	13	37	37	Reducing and preventing food waste is part of an overall aproach to green the supply chain and to promote sustainable production and consumption patterns. I suggest to include a reference to this aspect, too. Identifying the most suitable means to recirculate resources can be an area to be further analysed in the future (e.g. industrial symbiosis) in relation to material efficiency and energy efficiency. [Mihaela Stefanescu, Romania]	We include promotion of sustainable production in the new "sustainable sourcing" response option.
29419	35	13			A bit more could be said in this chapter (consumer and retail waste) about the drivers and potential solutions, but most of this comes from the gray literature. Drivers: low avarness of quantity and value of food wasted, relatively low food prices in the developed world leading to the time cost of waste preventative actions outweighing cost of the food itself, reduced cooking and food handling skils, retail environment, pricing and promotions, conservative date labelling etc. [Bojana Bajzelj, United Kingdom (of Great Britain and Northern Ireland)]	We have included this information in the section on barriers, as these are all factors that limit adoption of these options.
22821	35	14			Here the uncertainty in the literature needs to be indicated, different numbers in doi:10.1016/j.agsy.2017.01.014 [Anastasios Kentarchos, Belgium]	We have added this citation
10161	35	14			Here the uncertainty in the literature needs to be indicated, different numbers in doi:10.1016/j.agsy.2017.01.014 [Jean-Luc Chotte, France]	We have added this citation
27267	35	28			The expression "value-added products" cannot be found in chapter 5, please check. [, Germany]	Noted - reference to Chapter 5 removed.
21293	36	1	36	2	Could you please provide a reference for the claims that export bans and competition for biofuels led to food shocks in the case of 2007-08. [, United Kingdom (of Great Britain and Northern Ireland)]	Section rewritten
26395	36	15	36	15	should read: "geared towards: a) improving" [Aaron Smith, Norway]	Corrected
7555	36	15	36	31	Optimizing energy efficiency within refrigeration—through both engineering improvements and switching to low-GWP alternatives to HFCs, which are readily available on the market—and maintain the infrastructure are important to limiting food waste while also promoting food security. See 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; See also Carvalho S., et al. (2014) Alternatives to High-GWP Hydrofluorocarbons. [Durwood Zaelke, United States of America]	Noted. We appreciate the supportive comment and the references provided, but we prioritized response options that are supported by scientific evidednce over grey literature.
7631	36	15	36	31	Reemphasize the importance of improving cold chains for food transport and storage referenced in previous chapters. Also note that optimizing efficiency within refrigeration and maintain the infrastructure are important to limiting food waste while also promoting food security. See 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. [Kristin Campbell, United States of America]	Noted. We appreciate the supportive comment and the references provided, but we prioritized response options that are supported by scientific evidednce over grey literature.
26397	36	17	36	17	should read: "waste, and (c) minimizing" [Aaron Smith, Norway]	Corrected
26399	36	18	36	18	should read: "infrastructure, and improving" [Aaron Smith, Norway]	Corrected

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26401	36	19	36	19	should read: "(Chapter 2; Section 6.4; Ingram et al., 2016; Stathers et al. 2013), especially" [Aaron Smith, Norway]	Corrected
7839	36	19	36	19	6.4;(Ingram --> 6.4; Ingram [Hiroaki Kondo, Japan]	Corrected
26403	36	22	36	22	should read: "Stathers et al. 2013) with potential" [Aaron Smith, Norway]	Corrected
10175	36	24	36	24	of what? "over" in what sense, against what measure? [Jean-Luc Chotte, France]	'Over" is replaced with 'increased'
10177	36	26	36	27	this poorly worded statement is repeated from p35 [Jean-Luc Chotte, France]	Sentence removed
10179	36	28	36	29	repeated from p35 [Jean-Luc Chotte, France]	Sentence removed
26405	36	29	36	29	should read: "Technical, organizational, and climate" [Aaron Smith, Norway]	Corrected
21295	36	33	36	36	You have provided confidence statements here, but nowhere else in the long list of integrated response options. Please apply the use of confidence statements consistently (i.e. throughout or not at all). [, United Kingdom (of Great Britain and Northern Ireland)]	This has be revised in the new draft
26407	36	34	36	34	should read: "transportation, localized carbon" [Aaron Smith, Norway]	Corrected
26409	36	37	36	37	should read: "distribution, and access systems" [Aaron Smith, Norway]	Corrected
10359	36	41	36	41	Whether here or elsewhere in this chapter where urban and peri-urban agriculture is mentioned, the concept should be defined (and be added to the glossary). It involves recycling of water and nutrients involving human and animal wastes and use of urban lands to produce food within the urban center. It may also involve soil -less culture including aquaponics, hydroponics, aeroponics and tall glass buildings to capture light and enhance photosynthesis. [Jean-Luc Chotte, France]	This is well noted and reflected in the revision
26411	36	47	36	47	should read: "(Akhtar et al. 2016; Lee-Smith 2010; Revi et al. 2014)" [Aaron Smith, Norway]	Corrected
40805	36		36		lots of repetitions in various chapters on urban aspects of food systems. Hard to find the conclusions esp. When ch 6 does not give a summary message at the end using conf. Language. Check with ch 4-5. [Valerie Masson-Delmotte, France]	Corrected
10181	37	3	37	3	not clear what "from the consumer" means. How far consumers drive to the supermarket? How will this change with urban food production? [Jean-Luc Chotte, France]	This has been clarified
6097	37	4	37	4	urban food forest [, Poland]	Corrected
26413	37	7	37	7	should read: "for production," [Aaron Smith, Norway]	Corrected
26415	37	15	37	15	should read: "pharmaceutical, and cosmetic industries" [Aaron Smith, Norway]	Corrected
26417	37	19	37	19	should read: "processing, retail, and agri-food" [Aaron Smith, Norway]	Corrected
25603	37	19	37	19	A word about "zero-deforestation commitments" should be added in this section. Cf. GENERAL COMMENT ON SUPPLY CHAIN SUSTAINABILITY MANAGEMENT Some references: - Austin, K. G., Mosnier, A., Pirker, J., McCallum, I., Fritz, S., & Kasibhatla, P. S. (2017). Shifting patterns of oil palm driven deforestation in Indonesia and implications for zero-deforestation commitments. Land Use Policy, 69, 41-48. - Garrett, R. D., Levy, S., Carlson, K. M., Gardner, T. A., Godar, J., Clapp, J., ... & Barr, R. (2019). Criteria for effective zero-deforestation commitments. Global Environmental Change, 54, 135-147. [, France]	This is a good suggestion and has been considered in the revised
26419	37	21	37	21	should read: "related to: a)" [Aaron Smith, Norway]	Corrected
10183	37	21	37	21	products, services and inputs - such as renewable energy [Jean-Luc Chotte, France]	Good suggestion. Thanks. Sentence modified to replace 'and services' with ', services and inputs - such as renewable energy'
26421	37	27	37	27	should read: "(Chapter 2; Section 6.4; Song et al.,2017)" [Aaron Smith, Norway]	Corrected

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26423	37	35	37	35	should read: "(Chapter 5; Garnett et al. 2013)." [Aaron Smith, Norway]	Corrected
7841	37	35	37	35	5;(Garnett --> 5; Garnett [Hiroaki Kondo, Japan]	Corrected
26425	37	36	37	36	should read: "on organizational capacity" [Aaron Smith, Norway]	Corrected
26427	37	40	37	40	should read: "be realized either" [Aaron Smith, Norway]	Corrected
26429	37	43	37	43	should read: "(Gunatilake et al. 2014), while" [Aaron Smith, Norway]	Corrected
10185	37	43	37	43	what do you mean by marginal agricultural resources? Using renewable energy and improving energy efficiency will improve the carbon footprint of all ag products. [Jean-Luc Chotte, France]	Reference to marginal agricultural resource was in relation to transport fuel
26431	38	5	38	5	should read: "(Al-Mansour et al. 2017; Baptista et al. 2013)" [Aaron Smith, Norway]	OK
6099	38	5	38	5	(Al-Mansour et al. 2017; Baptista et al. 2013) - without ([, Poland]	OK
7843	38	5	38	5	2017;(-->2017 ; [Hiroaki Kondo, Japan]	OK
10195	38	7	38	13	These points are important but not clearly presented. Lower yields and higher levels of tillage, and use of manures, generally increases the carbon footprint of produce from organic systems. However, there are likely to be other sustainability benefits (reduced biodiversity impacts, high SOM), and benefits in addressing land degradation. Lower yields but higher nutritional value give opposing impacts on food security. [Jean-Luc Chotte, France]	Caveats added to new table is section 6.3
26441	38	10	38	10	should read: "Golay and Biglino 2013; Lavers 2012)" [Aaron Smith, Norway]	Corrected
21895	38	15	38	20	Material substitution involves the use of wood products not only for building materials, but for a diverse range of products with possible substitution impacts, for example, in the textile, chemical and packaging sectors. Moreover, interlinkages with other SDG goals could be identified also for wood product substitution. For example, substituting cotton for wood-based fibers in the textile sector could have positive implications for water management, due to the intensive use of fresh water for irrigation in cotton production. [, Finland]	We have added information on other applications of material subsititution and added the potential interlinkages with SDGs where the literature supports.
5701	38	16	38	20	this part needs to be written carefully. Since wood is from trees and we don't want deforestation, it is also more vulnerable to fire and flood [Sanaz Moghim, Iran]	We have expanded the discussion of material substitution, including a note on fire and the potential effects on forest.
22823	38	17	38	20	important to mention here that the use of wood in buildings basically 'stores' the carbon in the constructions while re-growth can lead to continued sequestration. Tradeoffs are the same as for all biobased production: land requirements. More wood in construction would require more plantations/harvesting so the common tradeoffs apply here as well [Anastasios Kentarchos, Belgium]	We have added the suggested information.
10187	38	17	38	20	important to mention here that the use of wood in buildings basically 'stores' the carbon in the constructions while re-growth can lead to continued sequestration. Tradeoffs are the same as for all biobased production: land requirements. More wood in construction would require more plantations/harvesting so the common tradeoffs apply here as well [Jean-Luc Chotte, France]	We have added the suggested information.
27269	38	19	38	20	"No evidence was found of any impact upon adaptation, prevention of desertification or land degradation, or delivery of food security." Please add a reference for this statement or clarify that you did not found any analysis on this matter, because in the current version it is unclear if there is a lack of studies or studies did not find evidence. [, Germany]	We have added information on the linkages between material substitution and all of these factors
39871	38	19	38	20	This sentence reads as though there is no evidence for the use of more wood as a material substitute, and would not have any direct or indirect land degradation. That is incorrect. [, United States of America]	We have added information on the linkages between material substitution and all of these factors

Comment No	From Page	From Line	To Page	To Line	Comment	Response
15673	38	19	38	20	I don't understand this statement. Isn't it clear that increased use of woody biomass for substituting fossil-fuel based materials can have impact e.g. on food security? If more plantations are created for producing fiber or timber then competition for land area tightens. Also, e.g. use of eucalyptus species may change the soil water balance to drier. [Tuomo Kalliokoski, Finland]	We have added information on the potential implications of material subsitution on food security
22825	38	23	38	47	This section lacks the essential nuance. The same is much better worded in Chapter 7 section 7.7.4. Better reflection on the wider literature should be given and some of the references are not properly used. The simple focus on establishing private land tenure may be destructive to common property systems and there is wide evidence for this. Forest titling and decentralisation has some good successes but has also lead to increased forest loss in other cases. The context dependency needs to be stressed and normative language promoting privatizaiton of land ownership and management is better avoided. Suggestion to replace this text by a very short text and refer to section 7.4.4 for more details. [Anastasios Kentarchos, Belgium]	These comments are now reflected in revised text - but this has moved to chapter 7 under 'land tenure' where it was combined with the previous text there from 7.7.4. The section already made note that privatization of land tenure was not appropriate in all contexts and that message has been strengthened in revisions. There was no normative langauge 'promoting' privatization - the reference was to reviews of literature where mitigation benefits had been seen after secure land titling (not privatization) had happened.
10189	38	23	38	47	This section lacks the essential nuance. The same is much better worded in Chapter 7 section 7.7.4. Better reflection on the wider literature should be given and some of the references are not properly used. The simple focus on establishing private land tenure may be destructive to common property systems and there is wide evidence for this. Forest titling and decentralisation has some good successes but has also lead to increased forest loss in other cases. The context dependency needs to be stressed and normative language promoting privatizaiton of land ownership and management is better avoided. Suggestion to replace this text by a very short text and refer to section 7.4.4 for more details. [Jean-Luc Chotte, France]	These comments are now reflected in revised text - but this has moved to chapter 7 under 'land tenure' where it was combined with the previous text there from 7.7.4. The section already made note that privatization of land tenure was not appropriate in all contexts and that message has been strengthened in revisions. There was no normative langauge 'promoting' privatization - the reference was to reviews of literature where mitigation benefits had been seen after secure land titling (not privatization) had happened.
26433	38	26	38	26	should read: "Lawry et al. 2017; Gebremedhin and Swinton 2003" [Aaron Smith, Norway]	OK
6101	38	26	38	26	remove / [, Poland]	OK
7845	38	26	38	26	2017\; -->2017; [Hiroaki Kondo, Japan]	OK
22827	38	27	38	29	Actually de work of De Schutter and DellÁngelo points at the fact that formalization of individual property rights is a threat to common property systems rather than a strengthening of rural systems and access and control of natural resources from local communities. Wrong use of citation, pls correct; DeSchutter cite is: doi:10.1080/03066150.2011.559008 [Anastasios Kentarchos, Belgium]	DeSchutter was not cited in this section (not sure what 'wrong use' refers to). The DeSchutter work specifically refers to land grabbing risks leading to a reponse to favor land titling and markets. He says directly "Both as a protection from evictions and in order to encourage land-related investments and thus productivity, security of tenure is vital for land users". Our section is in total agreement with this. This section is very careful to discuss 'securing land tenure' which in no way should be read as only 'formalizing individual property rights' or 'promoting land markets' (in fact we deliberately do not say either phrase). The text notes that revising national laws to allow community land tenure/commons to be recognized (not necessariy formalized) is one strategy here, but that there is context dependent framing that is important. This is in agreement with DeSchutter's conclusions.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10193	38	27	38	29	Actually the work of De Schutter and DellÁngelo points at the fact that formalization of individual property rights is a threat to common property systems rather than a strengthening of rural systems and access and control of natural resources from local communities. Wrong use of citation, pls correct; DeSchutter cite is: doi:10.1080/03066150.2011.559008 [Jean-Luc Chotte, France]	DeSchutter was not cited in this section. The DeSchutter work specifically refers to land grabbing risks leading to a reponse to favor land titling and markets. He says directly "Both as a protection from evictions and in order to encourage land-related investments and thus productivity, security of tenure is vital for land users". Our section is in total agreement with this. This section is very careful to discuss 'securing land tenure' which in no way should be read as only 'formalizing individual property rights' or 'promoting land markets' (in fact we deliberately do not say either phrase). The text notes that revising national laws to allow community land tenure/commons to be recognized (not necessariy formalized) is one strategy here, but that there is context dependent framing that is important. This is in agreement with DeSchutter's conclusions, as well as the citation that was in the text - Dell'Angelo, J., P. D'Odorico, M. C. Rulli, and P. Marchand, 2017: The Tragedy of the Grabbed Commons: Coercion and Dispossession in the Global Land Rush. World Dev., 92, 1–12,
2903	38	27	38	38	Collective tand tenure security contributes to mitigation as much as it does to adaptation. [David Kaimowitz, Nicaragua]	Yes, this is discussed under the mitigation section, but this whole text has now moved to 7.4.x
22829	38	30	38	36	needs rephrasing towards improved access of communities to land rather than the focus on property per se, see: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1549-0831.2003.tb00133.x [Anastasios Kentarchos, Belgium]	This section includes reference to community-based management already as one pathway to securing tenure and use rights; access is implied in the idea of 'management' but I have made this more explicit
10191	38	30	38	36	needs rephrasing towards improved access of communities to land rather than the focus on property per se, see: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1549-0831.2003.tb00133.x [Jean-Luc Chotte, France]	This section includes reference to community-based management already as one pathway to securing tenure and use rights; access is implied in the idea of 'management' but I have made this more explicit
26435	38	34	38	34	should read: "1) formalization through" [Aaron Smith, Norway]	OK
26437	38	35	38	35	should read: "decentralization; and 3) legal and policy frameworks that recognize" [Aaron Smith, Norway]	OK
26439	38	45	38	45	should read: "forest decentralization and" [Aaron Smith, Norway]	OK
2905	38	22	39	6	It would be important to refer to land and forest tenure, not just land tenure. [David Kaimowitz, Nicaragua]	Noted - this section has now moved to Chapter 7

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30565	38	22	39	6	The discussion of action to establish "secure tenure" is truncated and could benefit with more elaboration of options and lessons from scientific and empirical evidence. This sub section would be much improved if it included at least some evidence on barriers to secure tenure tights including flawed, outdated and incoherent national land and forest tenure laws, which often fail to recognise community property rights over customary unculivated forests and rangelands; corruption in land administration and licesing agencies; and denial of collective community tenure rights in resource concession systems applied under national extractivists policies that favour land alocation in support of industrial models of land use and foreign direct investment (FDI) and largely disregard community land governance and associated local models of land, forest and rangeland management. See for example, Monterrosso I, Cronkleton P, Pinedo D and Larson A M (2017) Reclaiming Collective Rights: land and forest tenure reform in Peru (1960-2016), Working paper 224, CIFOR, Bogor http://www.cifor.org/publications/pdf_files/WPapers/WP224Monterroso.pdf This same subsection would also be much strengthened by expanding the discussion of options for securing tenure rights beyond official land titling programmes. Core actions that can promote secure tenure and ensure *effective* and just land titling interventions include community tenure mapping, state recogntion of community maps and state recogntion of community self-demarcation of land and territorial boundaries - see for example St. Martin, K. (2009). "Toward a Cartography of the Commons: Constituting the Political and Economic Possibilities of Place." Professional Geographer 61(4(2009): 493-507; SciDevNet (2015) "Forest Communities Map Their Land Using Data Loggers" http://www.scidev.net/global/data/news/forest-communities-map-land-using-data-loggers.html See also Tenure Facility (2017) "Tenure Facility pilot in Cameroon develops standard methodology for participatory mapping" https://thetenurefacility.org/article/tenure-facility-pilot-cameroon-develops-standard-methodology-participatory-mapping/ [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	Noted and incorporated in to a revised section, now moved to Chapter 7

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30567	39	3	39	6	This text on indigenous peoples' tenure rights could benefit from other key scientific and empiricial sources demontrating the links between secure communal tenure rights, low deforestation rates and intact forests (see for example: Nepstad, D., Schwartzman, S, Bamberger, B., Santilli M, Ray, D., Schlesinger, P., Lefebvre, P., Alencar, A., Prinz, E., Fiske, G., and Rolla, A (2006) "Inhibition of Amazon Deforestation and Fire by Parks and Indigenous Lands" Conservation Biology 20(1)(2006): 65–73; Persha L, Agrawal A and Chhatre A (2011) "Social and ecological synergy: local rulemaking, forest livelihoods, and biodiversity conservation" Science 331(6024)(2011):1606-8. doi: 10.1126/science.1199343; Vergara-Asenjo, G. and Potvin, C. (2014) "Forest protection and tenure status: The key role of indigenous peoples and protected areas in Panama" Global Environmental Change (2014) 28:205–215. The section should also highlight here (or elsewhere in the IPCCC report - see YYYYY), that much of the world's above ground and sub soil carbon is stored in the forests, rangelands and biomass located on the territories of indigenous peoples and customary landowners making securing of these land tenure regimes vital in land and climate protection - see especially Garnett ST et al (2018) "A spatial overview of the global importance of Indigenous lands for conservation" Nature Sustainability 1 (July 2018):369-374; Reytar K and Veit P (2017) "5 Maps Show How Important Indigenous Peoples and Local Communities Are to the Environment" https://www.wri.org/blog/2017/12/5-maps-show-how-important-indigenous-peoples-and-local-communities-are-environment; See also COICA, AMPB, Repaleac, AMAN (2015) Tropical Forest Carbon in Indigenous Territories: a report prepared for UNFCCC COP21, December 2015 COICA, AMPB, Repaleac, AMAN, EDF and Woods Hole Research Center. The IPCC report should note this positive indigenous tenure-carbon stock correlation and emphasise tenure actions securing IP lands and territories as a priority and cost effective option for preventing land degradation and climate damage, which in turn can deliver mutiple social, cultural, livelihood and biodoiversity c-obenefits. On cost effectiveness of this option for titling and securing tenure rights for IPs and customary land managers, see Gray E, Reytar K, Altamirano J C, Blackman A and Hodgdon B (2016) Climate Benefits, Tenure Costs: The Economic Case For Securing Indigenous Land Rights in the Amazon WRI, Washington DC; See also Davis A, Kandel S (2016) Conservation and Community Rights: Lessons from Mesoamerica PRISMA, San Salvador http://rightsandresources.org/wpcontent/uploads/2017/02/Prisma_Conservation-and-Community-Rights_Lessons-fromMesoamerica_December-2016.pdf; Gray, E. et al. (2015). The Economic Costs and Benefits of Securing Community Forest Tenure : Evidence From Brazil and	The peer-reviewed references were added to this section, although the overall discussion has all now moved to ch 7.
39873	39	8	39	8	Recommend adding a quick definition of what "land grabbing" is. [, United States of America]	Added

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30569	39	8	39	46	Again, this sections does not document the drivers of land grabs linked to the corruption of governmental land agencies; failures to register community land claims by land administration bodies; illegal land trafficking linked to agribusines development and the cultivation of illicit crops (mainly C and S America) and the lack of the rule of law on the forest and resource extraction frontier see, for exampe, Martens J, Aguayo E, López X, Orrego R, Samaniego M, Ávalos M, Ríos V and Vargas S (2016) Deforestación e Impunidad: Análisis de la actuación del Ministerio Público y del Poder Judicial en los casos de deforestación en la zona del Bosque Atlántico del Alto Paraná (BAAPA) Instituto de estudios Comparados en Ciencias Penales y Sociales de Paraguay INECIP, Asunción . A weakensess in this section again is the absence of any option and proposed preventive action based on statutory regulation of value chains and new bindings laws in producer and importer countries on coprorate due diligence that would legally require companies and investors to ensure their value chains to not contain goods, services and commodities that embody illegal land acquisition, rights abuse and climate damage. While voluntary standards like the FAO VGGT are useful for promoting good land governance, they are insufficient on their own without improved legal regulation and law enforcement. Crucially, there is a need for reform of land allocation frameworks to make sure fraudulent land use change licenses, permits and leases cannot be issued on community and public lands without full compliance with applicable laws. Access to justice and efficient legal remedy to challenge illegal land acqusition are essential (see Bebbington et al (2018) op cit.). In some countries, there is also the need for judicial reforms to ensure a truly independent judicicary - see Colchester, M (2006) Justice in the Forest, CIFOR, Bogor. In short, a major driver of lan grabs and violence against land defenders is impunity for land grabbers who are not sanctioned for land theft, forced eviction, forced land sales or deception. Actions to prevent land grabs and protect community forests and carbon stocks may also be enabled by the use of community monitoring systems linked to early warning systems or land use monitoring networks that alert community governnance authorities and/or national law agencies of land trafficking, tenurial violations or illegal land encroachment - see Sheil D, Boissière M and Beaudoin G (2015) “Unseen sentinels: local monitoring and control in conservation’s blind spots” Ecology and Society 20(2): 39. http://dx.doi.org/10.5751/ES-07625-200239. See also Finer, M et al (2018) "Combating deforestation: From satellite to intervention Near–real-time monitoring and response are possible" Science 360(6395)(June 2018):1303-1305 [Thomas Griffiths, United Kingdom (of Great Britain and Northern Ireland)]	Policy frameworks and laws are the domain of Ch 7, which discusses VGGT. This section has been revised to acknolwedge this points regarding illegallity and corruption, new refs added (peer reviewed) and the whole section is now integrated into ch 7.4.4.
6883	39	13	39	13	Incorrect figures: We already noted this in the FOD. The Land Matrix does not report 200 Mio ha. The Land Matrix has recorded 26.7 Mio ha of concluded international agricultural deals (Nolte et al., 2016). This is the current source with comments the figures and puts them in the context. If you want to cite the website, the current figure is 49 Mio ha, but this includes also forestry, conservation and mining deals. REF: Nolte, Kerstin; Chamberlain, Wytske; Giger, Markus (2016). International Land Deals for Agriculture. Fresh insights from the Land Matrix: Analytical Report II. Bern, Montpellier, Hamburg, Pretoria: Centre for Development and Environment, University of Bern; Centre de coopération internationale en recherche agronomique pour le développement; German Institute of Global and Area Studies; University of Pretoria; Bern Open Publishing. [Markus Giger, Switzerland]	The corrected figures and citation have been added, although the whole section has now moved to ch 7.4.4.
6885	39	13	39	13	Nolte, Kerstin, Wytske Chamberlain, and Markus Giger. "International Land Deals For Agriculture: Fresh Insights from the Land Matrix: Analytical Report II." (2016): 68. [Markus Giger, Switzerland]	The corrected figures and citation have been added, although the whole section has now moved to ch 7.4.4.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6887	39	18	39	18	Messerli, P., M. Giger, M. B. Dwyer, T. Breu, and S. Eckert, 2014: The geography of large-scale land acquisitions: Analysing socio-ecological patterns of target contexts in the global South. Appl. Geogr., 53, 449–459, doi:10.1016/j.apgeog.2014.07.005. [Markus Giger, Switzerland]	Added
10199	39	18	39	19	this sentence is out of place in this par. The debate on impacts of biofuels on food prices is relevant but needs to be discussed more comprehensively. [Jean-Luc Chotte, France]	Sentence removed
33413	39	18	39	19	Bioenergy played a significant role in the food price crisis, primarily through food price impacts rather than the impacts on land. Land grab food security impacts would be more localized since land being seized from small holders profoundly impacts them but is not noticeable at the global food production level. See Dr. Chris Malians September 2017 literature review "Thought for Food: A review of the interaction between biofuel consumption and food markets" here: https://www.transportenvironment.org/sites/te/files/publications/Cerulogy_Thought-for-food_September2017.pdf and the Committee on Food Security's HLPE Report on biofuels from 2013 [Kelly Stone, United States of America]	Sentence removed
10201	39	21	39	21	do you mean that they plant a smaller area? [Jean-Luc Chotte, France]	Yes, clarified
6891	39	23	39	26	In addition to thoese mentioned you could refer to this this study, which makes the statement stronger: "A meta-study of published case studies has shown recurrent patterns of adverse impacts on local livelihoods (Oberlack et al 2016)" [Markus Giger, Switzerland]	Added, thanks, although the whole section has now moved to ch 7
6889	39	26	39	26	Oberlack, Christoph, Laura Tejada, Peter Messerli, Stephan Rist, and Markus Giger. "Sustainable livelihoods in the global land rush? Archetypes of livelihood vulnerability and sustainability potentials." Global environmental change 41 (2016): 153-171. [Markus Giger, Switzerland]	Added, thanks, although the whole section has now moved to ch 7
5203	39	28	39	30	This sentence is important because it introduces land grab cases not only in farmland but also other ecosystems such as forest. However, it does not fully elaborate why land grab in forest, for example, is also a problem. Therefore, we propose following improved sentences. "Land grabbing can threaten not only agricultural lands of farmers, but also protected ecosystems, like forests and wetlands, particularly in countries with good land availability and poor accessibility (Hunsberger et al. 2017; Carter et al. 2017). For example, in Cambodia, land grabbing in natural forest by agribusiness companies have made local farmers further convert the remaining protected and unprotected forest ecosystems into agricultural lands because the farmers' opportunities of collecting natural resin and forest foods as a means for ensuring their food security have been taken away by the plantation developments (Ehara et al., 2018). " Suggest adding reference: Ehara, M., K. Hyakumura, R. Sato, K. Kurosawa, K. Araya, H. Sokh, and R. Kohsaka, 2018: Addressing Maladaptive Coping Strategies of Local Communities to Changes in Ecosystem Service Provisions Using the DPSIR Framework. Ecol. Econ., doi:10.1016/j.ecolecon.2018.03.008. Short introduction of the paper available from here: http://www.ffpri.affrc.go.jp/ffpri/en/research/results/2018/20180622-01.html [, Japan]	Added, thanks, although the whole section has now moved to ch 7
10203	39	29	39	30	seems contradictory: land is simultaneously available but not accessible? [Jean-Luc Chotte, France]	Clarifed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2909	39	31	39	34	Providing secure collective land titles is obviously another way to limit land grabbing [David Kaimowitz, Nicaragua]	Option removed
10205	39	31	39	34	mention also the development of the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security, known as the VGGT. Bioenergy standards include requirements to protect land rights eg ISO 13065 [Jean-Luc Chotte, France]	Added as footnote
22831	39	36	39	37	Actually de work of DellÁngelo points at the fact that formalization of individual property rights is a threat to common property systems rather than a strengthening of rural systems and access and control of natural resources from local communities. Wrong use of citation, pls correct. See also http://www.harvardilj.org/wp-content/uploads/2011/07/HILJ_52-2_De-Schutter1.pdf; doi:10.1080/03066150.2011.559008; 10.1080/13600810120088859 [Anastasios Kentarchos, Belgium]	Securing land tenure does not have to mean individual private rights; it can mean community titles or even no titling at all. Reference to Dell'Angelo is correct in text: "Prevention of land grabbing can help strengthen local systems of common property management". We say nothing about formalization of individual property rights in this sentence.
10197	39	36	39	37	Actually the work of DellÁngelo points at the fact that formalization of individual property rights is a threat to common property systems rather than a strengthening of rural systems and access and control of natural resources from local communities. Wrong use of citation, pls correct. See also http://www.harvardilj.org/wp-content/uploads/2011/07/HILJ_52-2_De-Schutter1.pdf; doi:10.1080/03066150.2011.559008; 10.1080/13600810120088859 [Jean-Luc Chotte, France]	Securing land tenure does not have to mean individual private rights; it can mean community titles or even no titling at all. Reference to Dell'Angelo is correct in text: "Prevention of land grabbing can help strengthen local systems of common property management". We say nothing about formalization of individual property rights in this sentence.
26443	39	44	39	44	should read: "wetlands, and grasslands" [Aaron Smith, Norway]	OK
7411	39	18			I'm not convinced this sentence should start with 'however' in the context of the previous sentence and the fact the evidence is inconclusive. [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	OK
5401	40	1	40	16	The following assessment of cropland loss from urban area expansion might be useful here: Bren d'Amour, C., 2016. Future urban land expansion and implications for global croplands. PNAS 201606036. https://doi.org/10.1073/pnas.1606036114 [Helmut Haberl, Austria]	OK thanks
39875	40	2	40	3	Not only agricultural land but forest land as well. [, United States of America]	OK
26445	40	8	40	8	should read: "such urbanization have" [Aaron Smith, Norway]	OK
33573	40	17	40	27	In the next decade, the world of fishery will be deeply transformed. Scientific projections are based on an average increase in fishing catchments in high latitude regions and a drop in tropical regions, because of the warming of the oceans under the influence of climate change. If such redistribution of fish species is globalized, the global economy will be disrupted. (William & al. 2009 : Large-scale redistribution of maximum fisheries catch potential in the global ocean under climate change, Global change biology). Thus, if it is important to consider the prospective of an augmented pressure on lands, due to the declining fisheries activities. Moreover, an alternative to fish calories and nutrients will have to be found within the food systems. It will be all the more useful to anticipate the situation, in order to influence the evolutions of diets and agricultural practicies [Nicolas Siorak, France]	This is all true but this is a report about land management. We simply don't have the space to discuss improved fisheries management.
7169	40	20	40	20	Not only food security but livelihood is also at risk. [Debra Roberts, South Africa]	OK
26447	40	23	40	23	should read: "(Ellis 2008; DiGiano and Racelis 2012)" [Aaron Smith, Norway]	OK
26449	40	33	40	33	should read: "market liberalization" [Aaron Smith, Norway]	Removed
26451	40	34	40	35	should read: "(Ellis 1998; Barrett et al. 2001)." [Aaron Smith, Norway]	OK
7847	40	35	40	35	)(-->; [Hiroaki Kondo, Japan]	OK

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32619	40	40	41	5	really found interesting the seed sovereignty [Marta Guadalupe Rivera-Ferre, Spain]	Thanks!
28685	40	1		10	Management of Urban sprawl. Urbanisation leadimg to sprawl and extensification of cities along the rural-Urban fringe as been pointed to as a driver of agriculture land loss and a threat to food production around the cities. I recommend integrated Land use management, adaptive response, control rapid expansion of cities majorly in developing countries (Africa and the south-East Asia), Strict national security In farmland; Quick and strict adaptive response must be put in place. [Abiodun Adegoke, Nigeria]	These suggestions mirror what was already in the text
26453	41	7	41	7	should read: "such as: 1)" [Aaron Smith, Norway]	OK
10207	41	8	41	9	plus seasonal forecasting: mid-and long-range forecasts are important for planning farming activities (sowing, harvesting) and critical for implementation of drought plans (eg de-stocking) [Jean-Luc Chotte, France]	Useful comment, has been added to text, thanks
26455	41	38	41	38	should read: "highly subsidized by" [Aaron Smith, Norway]	OK
26457	41	45	41	45	should read: "supply and access has also not been assessed" [Aaron Smith, Norway]	OK
7849	42	10	42	11	Inconsistent referring to section number. 6.4.5 is referred with the word 'section', but no 'section' for others. [Hiroaki Kondo, Japan]	Corrected
7851	42	14	42	14	Missing yr-1 in the unit for some moderate positive and moderate negative [Hiroaki Kondo, Japan]	Corrected
7853	42	14	42	14	The range (or upper/lower limit) should be shown for inequality in small positive and small negative [Hiroaki Kondo, Japan]	Corrected
12971	42	14	42	15	Table 6.3: There is no agreed way to combine GHGs to give a CO2-eq. In particular the metrics for methane provided in AR5 WG 1 table 8.7 varied by a factor of 20. The effects of CO2 and methane mitigation need to be treated separately here, not combined. i.e. define "Large positive" as either > 3 GtCO2/yr or > n GtCH4/yr or > n GtN2O/yr. [William Collins, United Kingdom (of Great Britain and Northern Ireland)]	We use the agreed value for national greenhouse gas inventories
7171	42	15	42	22	This is a very useful table. Perhaps consider adding guidance on how this can be operationalised at regional/local levels? [Debra Roberts, South Africa]	That is what we do in section 6.5 - then followed up in Chapter 7
12973	42	16	42	16	This statement 1GtC yr-1 = 3.67 GtCO2-e yr-1 conflates the simple molecular mass converstion with the idea of CO2-equivalence. It is not obvious the GtC to GtCO2 conversion needs to be provided here as GtC isn't used in the table. More importantly the concept of CO2-equivalence is not well defined and depends strongly on the metric used. At the very least these concept and its uncertaintly needs to be explained, but I would strongly argue to report the different GHGs separately. [William Collins, United Kingdom (of Great Britain and Northern Ireland)]	We use the agreed value for national greenhouse gas inventories
26459	42	21	42	21	should read: "to about 800 million people" [Aaron Smith, Norway]	Corrected
25655	42	24	42	24	This typology of forest activities is not consistent with those used in chapter 2 and chapter 4, for example. We suggest that an additional effort be made to strengthen consistency within the report in how different forest activities are considered, in particular by using the same typology from one chapter to another. See GENERAL COMMENT ON THE TYPOLOGY OF FOREST ACTIVITIES. [, France]	The aggregation of forest option has been slightly change to keep consistency with other chapters
5205	42	24	66	3	Please make Table 6.4 - 6.18 larger for easy reading as the information provided in these tables is important for policymakers. [, Japan]	Corrected

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3305	42		66		I struggled to fully engage with this section. Though the content was clear and structured, it was difficult to engage because, given the slightly repetitive nature of the structure, more Figures would have aided my understanding and engagement with this section. I think there is potential to make the tables into bar charts for visual aids and better comparison of the data in the tables. E.g. 'potential' column could be the bars, 'confidence' column could be abbreviated e.g. Robust evidence, high aggrement --> RE, HA, 'citation' column could be footnotes? Or consider a similar Table as Table 6.19 in next section, which reduces the text load, additionally section 6.5.1 includes important information in bold and italics which helps to identify the key bits of infomation [Viola Heinrich, United Kingdom (of Great Britain and Northern Ireland)]	Comment 3683 suggests the opposite - structure maintained
3307	42		66		I struggled to fully engage with this section. Though thecontent was clear and structured, it was difficult to engage because, given the slightly repetitive nature of the structure, more Figures would have aided my understanding and engagement with this section. I think there is potential to make the tables into bar charts for visual aids and better comparison of the data in the tables. E.g. 'potential' column could be the bars, 'confidence' column could be abbreviated e.g. Robust evidence, high agreement --> RE, HA, 'citation' column could be footnotes? Or consider a similar Table as Table 6.19 in next section, which reduces the text load, additionally section 6.5.1 includes important information in bold and italics which helps to identify the key bits of information [Viola Heinrich, United Kingdom (of Great Britain and Northern Ireland)]	Comment 3683 suggests the opposite - structure maintained
21571	42	8			A major issue in Section 6.4 is in my view that the section should have been able to simply cite evidence provided in chapters 2-5 to sumarise the numbers found in tables 6.4ff - but instead it uses mainly primary literature. In some instances, the numbers given in the tables (and supporting text) are different to numbers provided in the relevant chapter (2-5), in some cases those chapters provided no numbers at all. This isn't really a problem for chapter 6 only, it's really a flag that more work is needed across chapters to ensure that chapters 2-5 provide a robust and comprehensive evidence base that chapter 6 can then draw on and summarise, rather than create its own evidence base that sits side-by-side (in some cases uncomfortably so) with the evidence coming out of the other chapters. [Andy Reisinger, New Zealand]	Cross referencing improved throughout
21595	42	8			The discussion of potentials in section 6.4 with regard to mitigation needs to be clearer and consistent regarding carbon prices. Are the potentials for a given carbon price (are they always the same prices), or no carbon price? Are they technical or economic potentials (and is this the same for each entry)? My sense is that this is not consistent, meaning the numbers aren't comparable. More importantly, spelling carbon prices out is important because it provides a crucial bridge to the policy chapter 7: the stated potentials can only be realised if those emissions are exposed to those carbon prices (or to regulations that create equivalent shadow prices). The mitigation potentials based on zero emissions price will generally be much lower as they would rely on co-benefits only. A similar issue arises for adaptation where non-monetary values and benefits are concerned. It doesn't mean that policies have to impose explicit prices, but it does mean that policies have to be serious about creating incentives that go well beyond the entry point of co-benefits if the potentials listed in the tables in this section are to be realised. [Andy Reisinger, New Zealand]	Done as far as possible

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3683	42				This whole subchapter is well structured and written. This could be an example for the structuring of other main chapters of the Report [Cordula Ott, Switzerland]	Thank you for these positive comments
10209	43	1	43	4	needs introductory discussion on technical (theoretical) potential vs economic vs implementable (feasible) potential (within a specified timeframe) Then specify which potential you are presenting below. [Jean-Luc Chotte, France]	Done as far as possible
7173	43	5	43	5	Can you add an explanation on how the assessment was performed? It is not evident how some of the options with a single citation are assessed as having robust evidence and high agreement. This should be taken into account for subsequent similar tables [Debra Roberts, South Africa]	Uncertainty language revisited
8201	43	5	43	5	One of the integrated response options is called Ecosystem-based adaptation with a mitigation potential of 23,8 Gt CO2-e. When reading the refrence «Griscom et al 2017» the title of the publication is «Natural Climate Solutions» and one of the key words is mitigation, not adaptation. The mitigation potential is 23,8 Gt CO2-e in 2030, a significant contribution to the Paris agreement. However it is not one mitigation option in addition to the other options listed in table 6.4, but rather a portifolio of actions that covers many of the options in table 6.4. [Harold Leffertstra, Norway]	Reworded to clarify
27271	43	5	43	6	Please check the assessment of confidence levels, e.g., the one for BECCS which is higher than elsewhere in the report where its mitigation potential is described as uncertain. [, Germany]	We have revised our confidence levels to ensure consistency throughout this special report and consistency with the SR1.5
17237	43	5	43	6	Data in Table 6.4 might not be applicable to several climate conditions (i.e tropics and sub-tropics). As for "potential" collumn, it could be useful if potetial data presents average potential with its range (min - max). [Hoang Anh Le, Vietnam]	Global values given
25113	43	5	43	6	It is difficult to read texts in Table 6.4/6.6/6.6/6.7.....6.18 [Junguo Liu, China]	Corrected
1939	43	5	43	7	The font in Table 6.4 seems too small to me. I suggest authors consider an increase in font size. Same for Tables 6.5-6.18. [William Lahoz, Norway]	Corrected
12773	43	6	43	6	The text in table 6.4 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Corrected
10211	43	7	43	8	need to acknowledge the various papers suggesting that this is not actually a viable option - criticizing 4 per 1000, for example. agree that there is robust evidence and high agreement but there are nevertheless high profile dissenters and papers in reputable journals. It would be good to discuss this more comprehensively. [Jean-Luc Chotte, France]	Dissent now included
10213	43	7	43	8	yes, but you haven't listed this as a response option [Jean-Luc Chotte, France]	Only response options are considered - some consist of multiple interventions
26461	43	8	43	8	should read: "(Smith et al. 2008;" [Aaron Smith, Norway]	Corrected
7855	43	8	43	8	(Smith et al.(2008); --> (Smith et al. 2008; [Hiroaki Kondo, Japan]	Corrected
27273	43	13	43	13	Regarding "overlap with response option/s": We suggest an explanation like in the beginning of chapter 6.5, or perhaps link to other text passages. [, Germany]	Done
26463	43	16	43	16	should read: "from Smith et al.(2008), which" [Aaron Smith, Norway]	Corrected
7857	43	16	43	16	(Smith et al.(2008) --> Smith et al.(2008) [Hiroaki Kondo, Japan]	Corrected
7859	43	17	43	18	(Herrero et al.,2016) --> Herrero et al.(2016) [Hiroaki Kondo, Japan]	Corrected
27275	43	19	43	19	Regarding "overlap with response option/s": We suggest an explanation like in the beginning of chapter 6.5, or perhaps link to other text passages. [, Germany]	Done
26465	43	22	43	22	should read: "from Smith et al.(2008), which" [Aaron Smith, Norway]	Corrected

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7861	43	22	43	22	(Smith et al.(2008) --> Smith et al.(2008) [Hiroaki Kondo, Japan]	Corrected
7863	43	23	43	24	(Herrero et al.,2016) --> Herrero et al.(2016) [Hiroaki Kondo, Japan]	Corrected
27277	43	25	43	25	Regarding "overlap with response option/s": We suggest an explanation like in the beginning of chapter 6.5, or perhaps link to other text passages. [, Germany]	Corrected
15675	43	25	43	26	Why this old reference? No newer ones to support this finding? Hard to believe this kind of thing (N2O flux counterbalancing increasing soil carbon benefits) being a common problem. [Tuomo Kalliokoski, Finland]	It is a common problem since N2O is 298 times more potent as a GHG than CO2
26467	43	30	43	30	should read: "Bennetzen et al. 2016), which means" [Aaron Smith, Norway]	Corrected
7865	43	32	43	32	(Zomer et al.(2017) --> Zomer et al.(2017) [Hiroaki Kondo, Japan]	Corrected
10215	43	32	43	33	how have you used this to assess potential? [Jean-Luc Chotte, France]	Explained in the text
12975	43	1	45	38	There is no agreed conversion to generate GtCO2-eq yr-1. For instance the methane metrics in IPCC AR5 WG 1 table 8.7 vary by a factor of 20. It would be more scientifically accurate if CO2, methane and N2O mitigation were quoted separately, rather than aggregating them in the controversial (and undefined in the report) CO2eq. [William Collins, United Kingdom (of Great Britain and Northern Ireland)]	We use the agreed value for national greenhouse gas inventories
39877	43	5	45	38	Like in Chapter 2, advise the authors to be clearer with study caveats and limitations. Though this section references the Chapter 2 discussion, it should be made clear here that some of the studies cited use different methods, assumptions, scenarios, scenario parameters, etc., and therefore caution should be used when comparing them. Also, it is better to cite some of the studies for which the forest-related estimates are based. For example, Griscom et al. don't actually do any modeling, but gather information from a variety of other studies, comparing results from different modeling exercises without explaining how the results differ and which are stylized to avoid conflicts with food production and which are not, which is a problem. It would be better/stronger here, especially in the table, to cite the actual work/studies that Griscom et al. seeks to reflect. And should include studies that generate cost esimates for LU mitigation responses like Sohngen and Mendelsohn (American Journal of Agricultural Economics, 2003); Kindermann et al. (PNAS; 2008); Golub et al. (PNAS, 2012); Favero et al. (Climatic Change, 2017); Baker et al. (Energy Policy online in 2018). [, United States of America]	Cross referencing to other chapters improved
9949	43	1	59	37	Tables 6.4 to 6.15 and the supporting text of these tables provide citations for the estimates in the tables. However, these seem to be cherry-picked from the liteature ignoring the wider literature. As these tables provide essential information on which policy decisions may be based they really need to reflect the full literature and systematic reviews of the numbers presented from the wider literature including variation in assumptions need to be made. [Jean-Luc Chotte, France]	Cross referencing added and more literature citations added - uncertainty language revisited
21573	43	6			Table 6.4: under "management of pollution", why is the potential given as "reduce terrestrial C uptake" - should the potential not be "increase terrestrial C uptake"? [Andy Reisinger, New Zealand]	Management of pollution could have both positive and negative effects on reducing global warming. Via atmospheric transport of pollutants, nitrogen deposition on land have a potential to increase terrestrial carbon uptake.
25115	43	32			Wrong format for the reference [Junguo Liu, China]	Corrected

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14295	43				Table 6.4 re Biochar: Feasible potential needs to be defined and supported. What are the assumptions? is this a market potential? If so, what carbon price was assumed. At higher carbon prices the feasible potential approaches the technical potential, so this is not a meaningful qualification. Also, it is inconsistent with treatment of all other responses, for which only technical potential is given. Therefore inclusion of market potential only here seems biased. Futhermore, what is the justficiation for using only the carbon stabilisation potential rather than life-cycle impacts? The values for bioenergy and BECCS include reduced fossil fuel reliance, therefore there is no justification to exclude these impacts here. If bioenergy and BECCS were assessed on an equivalent basis to this, their potentials would be zero or negative. This table needs to be updated using consistent assessment for each option. [Lukas Van Zwieten, Australia]	We have revised the estimates of both biochar and bioenergy and updated our confidence levels.
14297	43				Table 6.4 re Bioenergy: "High agreement" is inaccurate: estimates of bioenergy potential span some orders of magnitude. e.g. Hoogwijk 2003 (Exploration of the ranges of the global potential of biomass for energy); AR5; Creutzig et al 2014. A large controversy remains about actual potential so should read "Medium evidence, low agreement" As a side note, the term "high agreement" is used frequently throughout this chapter often with only a very limited number of references to support each point. The fact that authors reviewed a small subset of the literature and found high agreement within the few sources they cite should not be taken as evidence that high agrement exists within the scientific community or literature at large. Overall, there has been too little effort expended in undertaking a comprehesive literature review of the topics in this chapter. [Lukas Van Zwieten, Australia]	We have revised our confidence levels to ensure consistency throughout this special report and consistency with the SR1.5
15677	44	1	44	1	Is this misinterpretation of "Natural Forest Management" of Griscom et al. paper? It does not refer to managing natural forests but changing forest management closer to natural dynamics in the managed forests, e.g. increasing rotation time, milder thinnigs etc. [Tuomo Kalliokoski, Finland]	The aggregation of forest option has been slightly change to keep consistency with other chapters
6155	44	1	44	2	Refering to Griscom et al. 2017 there is now one value given for the mitigation potential, please add a range OR uncertainty estimate. These values are having high uncertainty and therefore single values should not be provided like this. Same applies for following sentences in the same page. [Aleksi Lehtonen, Finland]	The mitigation numbers are addressed in more detail in Ch 2
2911	44	1	44	11	The text should note that improved management of natural forests in the tropics could also have significant climate mitigation benefits from changes in albedo, evapotranspiration, aerosols, surface roughness, and other processes, in addition to the reductions in net forest carbon emissions. [David Kaimowitz, Nicaragua]	This has been explictily note for reducing deforestation
10217	44	1	44	11	is this about forest management or agroforestry? These are two separate response options [Jean-Luc Chotte, France]	deleted in this section
26469	44	9	44	9	should read: "(Houghton and Nassikas 2018; Mbow et al. 2014)" [Aaron Smith, Norway]	Done
26471	44	13	44	14	should read: "(Campbell et al. 2014; Cohn et al. 2017)." [Aaron Smith, Norway]	Done
26473	44	18	44	18	should read: "(Stallard 1998; Smith et al., 2001;" [Aaron Smith, Norway]	Done
10355	44	19	44	19	"Erosion control" is not defined here or in the glossary, but it needs to be. It refers to the strategy of an effective management of accelerated soil erosion caused by water and wind to minimize the risks of desertification and restoration of desertified land and ecosystems. [Jean-Luc Chotte, France]	Now included in the glossary

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10219	44	21	44	23	What do you mean by "highly constrained environments"? It seems you are saying that it is a minor issue. Dryland salinity is a widespread issue: Wong, that you cite, say 932 M ha are affected by salinity globally, so it is certainly not a limited area. None of the papers cited provides evidence to support the statement that the potential is modest. Relevance of UNCTAD reference is unclear. There is potential for substantial increases in the area of land affected by salinization because of sea level rise, changes to the water balance cause by irrigation and land management, and the potential for drying conditions under climate change to result in increased areas of salinisation. This will result in reduced plant productivity, reduced NPP and an overall loss of soil carbon as soil organic matter is decomposed without replacement. [Jean-Luc Chotte, France]	accepted. Perhaps redaction was unclear. Mitigation potential is modes in terms of soil carbon increases, but may be important considering the extended areas covewred by salt-affected soils.
26475	44	22	44	22	should read: "salinization" [Aaron Smith, Norway]	Done
26477	44	22	44	22	should read: "(Wong et al. 2010; UNCTAD 2011; Dagar et al." [Aaron Smith, Norway]	Done
7175	44	22	44	22	Consider explaining what is meant by a 'a very modest' mitigation potential. If possible, consider adding the actual value as 'very modest' could be interpreted to mean different things by different people. [Debra Roberts, South Africa]	Wording changed
7867	44	22	44	22	(UNCTAD 2011;-->UNCTAD 2011; [Hiroaki Kondo, Japan]	Done
26479	44	24	44	24	should read: "by minimizing anoxic" [Aaron Smith, Norway]	Done
7177	44	26	44	26	Consider explaining what is meant by a 'a very modest' mitigation potential. If possible, consider adding the actual value as 'very modest' could be interpreted to mean different things by different people. [Debra Roberts, South Africa]	Wording changed
2913	44	28	44	32	The emissions reductions from fire management should not be presented totally separate from those from improve forest management and the two are closely linked - although some wildfire emissions are not from forests. [David Kaimowitz, Nicaragua]	Point taken, but here we treat them as separate options
26481	44	32	44	32	should read: "period (Arora and Melton 2018" [Aaron Smith, Norway]	Done
7179	44	34	44	34	Consider explaining what is meant by a 'a very modest' mitigation potential. If possible, consider adding the actual value as 'very modest' could be interpreted to mean different things by different people. [Debra Roberts, South Africa]	Wording changed
26483	44	35	44	35	should read: "Griscom et al. 2017) estimated" [Aaron Smith, Norway]	Done
7869	44	35	44	35	(Griscom et al. (2017) --> Griscom et al. (2017) [Hiroaki Kondo, Japan]	Done
10221	44	35	44	36	Griscom do not use the term ecosystem-based adaptation therefore it is misleading to cite their paper as evidence for this option. This is their estimate for all natural mitigation options. [Jean-Luc Chotte, France]	EBA has been removed as an option
26485	44	37	44	37	should read: "forest, peatland, and wetland" [Aaron Smith, Norway]	Corrected
2915	44	38	44	41	Again the mitigation potential of reducing tropical forest loss is even higher if one considers the non-GHG emission pathways through which land use influences climate. [David Kaimowitz, Nicaragua]	Not this is explicit
15679	44	39	44	39	Rockström et al. 2017, Science, Roadmap to rapid decarbonization gives ca. Same value for deforestation as Griscom et al. [Tuomo Kalliokoski, Finland]	The mitigation numbers are addressed in more detail in Ch 2
15681	44	40	44	41	How negative emissions are defined here? Is this value additional on current sink? Remove repetition of time span. [Tuomo Kalliokoski, Finland]	Wording changed
7871	44	41	44	41	"between 2016 and 2100" is duplicated. [Hiroaki Kondo, Japan]	Done
26487	44	42	44	42	should read: "Shindell et al.(2012)" [Aaron Smith, Norway]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7873	44	42	44	42	(Shindell et al.(2012) --> Shindell et al.(2012) [Hiroaki Kondo, Japan]	Done
7557	44	42	45	2	These measures from Shindell et al 2012 are also elaborated upon in a UNEP and WMO collaboration Report. UNEP & WMO (2011) INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE, 262 (“Impacts of the measures vary from region to region depending upon the local mix and size of emissions changes, the local background state of the atmosphere, and particular local physical processes such as rainfall rates that remove some pollutants from the atmosphere and snow cover. …The 16 measures examined here, including the measures on pellet stoves and coal briquettes, reduce warming in the Arctic by 0.7ºC (range 0.2 to 1.3ºC) at 2040. This is a large portion of the 1.1ºC (range 0.7 to 1.7ºC) warming projected under the reference scenario for the Arctic, and hence implementation of the measures would be virtually certain to substantially slow, but not halt, the pace of Arctic climate change.”). Additionally, the CCAC is the only global institution working to mitigation SLCPs and a leader in providing routinely updated information on mitigation measures. [Durwood Zaelke, United States of America]	UNEP and WMO (2011) are referred. Global estimates are mainly discussed in this section.
7633	44	42	45	2	These measures from Shindell et al 2012 are also elaborated upon in a UNEP and WMO collaboration Report. UNEP & WMO (2011) INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE. [Kristin Campbell, United States of America]	UNEP and WMO (2011) was referred.
40807	44		45		This reads as a list / catalogue without key findings or confidence assessment. Needs to be sharpened. Elements of gaps to be conveyed together in a final section on knowledge gaps. [Valerie Masson-Delmotte, France]	The key findings are summarised in section 6.5 which follows directly from 6.4
26489	45	1	45	1	should read: "(Vries et al.,2009; de Vries et al.,2008; Zaehle et al.,2011)" [Aaron Smith, Norway]	Done
7875	45	1	45	1	Vries et al.,2008) (Zaehle --> Vries et al.,2008; Zaehle [Hiroaki Kondo, Japan]	Done
25751	45	8	45	9	biochar potential could be increased according to comments 2, 4 and 6. [Roque Pedace, Argentina]	Wording changed
26491	45	10	45	10	should read: "carbon stabilization; Table 6.4" [Aaron Smith, Norway]	Done
26493	45	12	45	12	should read: "Fuss et al.,(2018) propose" [Aaron Smith, Norway]	Done
7877	45	12	45	12	(Fuss et al.,(2018) --> Fuss et al.(2018) [Hiroaki Kondo, Japan]	Done
15683	45	12	45	12	No newer studies of this? [Tuomo Kalliokoski, Finland]	Fuss et al. 2018 is quoted - very recent
1941	45	12	45	12	I suggest authors check the parentheses. There are other instances in the text. [William Lahoz, Norway]	Done
14299	45	12	45	13	a) Fuss describe this not as the sustainable potential but as the "authors' assessment of deployment potential" b) Fuss et al. give the range of literaturee estimates as 1–35 Gt CO2-e /yr. Since the Fuss et al study was a systematic review, rather than original research, it needs to be mentioned that the actual result of this systematic review was 1-35 Gt, whereas the lower range (0.5-2) is an opinion of the authors, rather than a robust estimate based on new analysis. [Lukas Van Zwieten, Australia]	Wording changed
7879	45	13	45	13	by (Smith 2016) --> by Smith (2016) Is this Smith (2016a) or(2016b)? [Hiroaki Kondo, Japan]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14301	45	13	45	13	The actual range should be given here. Also it should be noted that the minimum (0.7 Gt CO2) of this range is based on an estimate of costs taken from Shackley et al. 2011. However Shackley et al explicity state that their estimate is *not* of a full cost-benefit analysis, but relates only to what they describe as a "minimum breakeven selling point" (MBSP) which explicitly excludes the value of the biochar from its assessment. Therefore the use of this MBSP by Smith 2016 as a basis for determining the economic feasibility of biochar is misguided. It therefore needs to be acknowledged that the basis for Smith 2016 assessment does not include the benefits of biochar in terms of climate-change abatement (which would be represented as a carbon price in the economic assessment) nor of its benefit to food production in terms of increased yields and/or reduced inputs. The Smith et al result is thus as a minimum feasible potential when value of biochar is zero. If the carbon price or agronomic value of biochar increase above zero, the deployment potential will increase above this estimate accordingly, up to a maximum determined by the technical potential when carbon prices are sufficiently high. [Lukas Van Zwieten, Australia]	Wording changed
22833	45	15	45	18	the message in this paragraph is ambiguous. Propose to delete the word : moderate [Anastasios Kentarchos, Belgium]	Corrected
7881	45	16	45	16	2030 Griscom --> 2030 (Griscom [Hiroaki Kondo, Japan]	Corrected
26495	45	16	45	17	should read: "(Griscom et al. 2017)" [Aaron Smith, Norway]	Corrected
21297	45	17	45	18	It is more than a temporary increase in CH4 emissions - see https://doi.org/10.5194/bg-12-4361-2015 . Suggest deleting 'temporary'. [, United Kingdom (of Great Britain and Northern Ireland)]	Done
15685	45	23	45	24	BVOC and SOA effect on cloud albedo missing in this thinking. [Tuomo Kalliokoski, Finland]	BVOC and SOA effect on cloud albedo have been discussed well in other chapters, particularly in Chapter 2, and this part was not described in this section in detail to reduce too much duplication.
691	45	26	45	28	This sentence cites IPBES 2018 as the source for the statement that 12 Mha are lost to degradation each year. However a keyword search of IPBES 2018 did not locate this number; moreover the IPBES report clearly states on p. 317 that" … the global extent, severity and trends in degradation remain inconclusive". Either a page reference to the IPBES report should be provided or this figure for land "lost" should be deleted. [Daniel Pennock, Canada]	It refers to the IPBES land degradation report - citation corrected
26497	45	27	45	27	should read: "(Poeplau et al. 2011)." [Aaron Smith, Norway]	Done
26499	45	28	45	28	should read: "(Poeplau et al. 2011)" [Aaron Smith, Norway]	Done
10223	45	28	45	32	acknowledge the wide range and therefore uncertainty in the estimate [Jean-Luc Chotte, France]	Done
10225	45	32	45	32	the figure in the table is o.4? [Jean-Luc Chotte, France]	Done
26501	45	34	45	34	should read: "(Beerling et al. 2018; Lenton 2010" [Aaron Smith, Norway]	Done
10227	45	36	45	36	why don't you give the values as you have for all the other options? [Jean-Luc Chotte, France]	We have added the amounts
22835	45	36	45	38	The facts expressed after 'however' suggest that the 'large sequestration potential" of BECCS is questionable. If land-use change emissions are not included, then probably land use emissions and foregone sequestration (such as that from increased forest harvest) are also not included. That should be emphasized, as it may be more significant than LUC. [Anastasios Kentarchos, Belgium]	We have adjusted the bioenergy potentials to include only estimates from bottom-up models, which often exclude these factors. We have noted that LUC and N2O are included in the models estimating the economic deployment of bioenergy
12777	46	1	46	1	The text in table 6.5 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25605	46	1	46	2	In table 6,5, "Improved sustainability of food processing..." should be distinguished from "improved energy efficency". [, France]	From a mitigation standpoint, improved energy efficiency is used as a proxy for improved sustainability of food processing.
32621	46	1	46	2	We can help in our chapter (5) to finish this table. Sorry I cannot provide them now but I could not download the chapter until today 14th, last day of revisions, due to problems with my password [Marta Guadalupe Rivera-Ferre, Spain]	Many thanks - we have now received input from Ch5
22837	46	4	46	5	Here again the broader literature need to be reflected as the curent references do not present the full range of estimates available in the literature [Anastasios Kentarchos, Belgium]	Done
10229	46	4	46	5	Here again the broader literature need to be reflected as the curent references do not present the full range of estimates available in the literature [Jean-Luc Chotte, France]	Done
7413	46	7	46	9	Maybe gaps in research and literature like these should be more explicitly collated and flagged, these are potential areas of future research [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Now flagged as a gap
7559	46	10	46	14	Optimizing energy efficiency within refrigeration—through both engineering improvements and switching to low-GWP alternatives to HFCs, which are readily available on the market—and maintain the infrastructure are important to limiting food waste while also promoting food security. See 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; See also Carvalho S., et al. (2014) Alternatives to High-GWP Hydrofluorocarbons. [Durwood Zaelke, United States of America]	Noted. We appreciate the supportive comment and the references provided, but we prioritized response options that are supported by scientific evidednce over grey literature.
7635	46	10	46	14	Optimizing energy efficiency within refrigeration—through both engineering improvements and switching to low-GWP alternatives to HFCs, which are readily available on the market—and maintain the infrastructure are important to limiting food waste while also promoting food security. See 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; See also Carvalho S., et al. (2014) Alternatives to High-GWP Hydrofluorocarbons. [Kristin Campbell, United States of America]	Noted. We appreciate the supportive comment and the references provided, but we prioritized response options that are supported by scientific evidednce over grey literature.
26503	46	11	46	11	should read: "(James and James 2010; Vermeulen et al.2012)." [Aaron Smith, Norway]	Done
7883	46	11	46	11	)(--> ; [Hiroaki Kondo, Japan]	Done
12779	46	23	46	23	The text in table 6.6 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
2917	46	25	46	27	Note that the authors of that paper consider this a very conservative estimate. There is sufficient evidence that the percentage of these lands without secure title is large and that the difference in mitigation results between land with secure and insecure collective tenure is substantial to doubt the conclusions that the climate mitigation potential of improving collective tenure security is relatively small. In addition it has been shown to be very cost effective. [David Kaimowitz, Nicaragua]	Estimate figures have been clarified, mitigation potentials have been increased but this is not in ch 6 anymore - moved to ch 7.4.4.
10231	46	27	46	27	Agreed that this is very much unclear. The numbers in table 6.6 are only speculative and based on one reference (high agreement?). Better do not mention a number here given the uncertainty and lack of good studies. [Jean-Luc Chotte, France]	Mitigation potentials from land tenure have been removed
39879	46	29	46	32	The way this example is described is much different than others and is not entirely clear when referring to an "estimated carbon debt" from conversion. This would be saying there is a carbon sink of/emitting 24.5 tC per ha over 20 years? Recommend making this clearer. [, United States of America]	Removed as a mitigation option from the table

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7885	46	30	46	30	miombo --> Miombo [Hiroaki Kondo, Japan]	Removed as a mitigation option from the table
26505	46	34	46	34	"very low density urban fabrics". Is factories meant by "fabrics"? [Aaron Smith, Norway]	Wording has been changed to clarify
26507	46	36	46	37	suggestion: "quantified (Thornbush et al. 2013). Suggestions" [Aaron Smith, Norway]	Done
21575	46	2			Table 6.5: as just one example of inconsistencies between numbers in chapter 6 and numbers in another chapter, chapter 5 gives the emissions from food loss and waste as 4.4 Gt, whereas here it is stated that each (?) cause emissions of 5 Gt. Also, is the potential really that high (i.e. are the authors saying that technically, ALL food loss and waste could be avoided)? That seems to go beyond what we normally consider even just as 'technical potential' and becomes at best a 'theoretical upper bound'. The same may apply to some other numbers in other tables - please be sure to be consistent with what you call "potential" in the different entries. [Andy Reisinger, New Zealand]	Harmonised with Chapter 5 values
22839	46	27			Agreed that this is very much unclear. The numbers in table 6.6 are only speculative and based on one reference (high agreement?). Better do not mention a number here given the uncertainty and lack of good studies. [Anastasios Kentarchos, Belgium]	Mitigation potentials from land tenure have been removed
8343	47	19	33		Comments apply to section 6.4. This whole chapter is unbalanced, too positive on benefetis of increased OM for crops and missing a large body of literature that is very critical of the idea that increasing OM in soils is a net sink of C. The benefits of OM are limited beyond a critical amount (which may be at a rather low level). Two independent reviews of experiments have shown that net effects of increasing OM are non-existend when correcting for the effect of added nutrients, with exception of some root crops (Hijbeek et al 2017; Sjonning et al 2018). Obviously, removing C from the atmosphere and adding to soils is atractive, yet it may costs emission and requires intensive and proper management or abandoning of land. The benefits of the 4p1000 area heavily debated and questioned (e.g. Baveye et al; Amundson et al. 2018). The key is that added C to soils has a very limited residence time and enormous amounts need to be added to first increase and then retain higher C levels in soils, only a fraction of 0.082 of added C as OM remains in the soil after 20 years (Fujisaki et al 2018). Residence times are especially short on dryland soils. Only very wet or cold lands (peatlands, chernozems etc) are suitable for long term C storage. Further, it is really questionable if needed OM for large scale increase of soil OM is available and is best used to increase soil OM, directly competing with feed, energy and food production. Further, there are important demands in terms of stoichiometry, only when OM is added with proper nutrients it can contribute to soil C, otherwise C is simply respired by soil biota (e.g. Kirky et al 2012;2016). [Antonius Schut, Netherlands]	Nuance added

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8345	47	19	33		Baveye, P. C., J. Berthelin, D. Tessier and G. Lemaire (2018). "The “4 per 1000” initiative: A credibility issue for the soil science community?" Geoderma 309: 118-123. Amundson, Ronald and Léopold Biardeau. “Opinion: Soil carbon sequestration is an elusive climate mitigation tool” Proceedings of the National Academy of Sciences of the United States of America vol. 115,46 (2018): 11652-11656. Poulton, P., J. Johnston, A. Macdonald, R. White and D. Powlson (2018). "Major limitations to achieving “4 per 1000” increases in soil organic carbon stock in temperate regions: Evidence from long-term experiments at Rothamsted Research, United Kingdom." Global Change Biology Early view: 1-22. Sommer, R., B. K. Paul, J. Mukalama and J. Kihara (2018). "Reducing losses but failing to sequester carbon in soils – the case of Conservation Agriculture and Integrated Soil Fertility Management in the humid tropical agro-ecosystem of Western Kenya." Agriculture, Ecosystems & Environment 254(Supplement C): 82-91. [Antonius Schut, Netherlands]	Nuance added
8347	47	19	33		Hijbeek, R., M. K. van Ittersum, H. F. M. ten Berge, G. Gort, H. Spiegel and A. P. Whitmore (2017). "Do organic inputs matter – a meta-analysis of additional yield effects for arable crops in Europe." Plant and Soil 411(1-2): 293-303. Schjønning, P., J. L. Jensen, S. Bruun, L. S. Jensen, B. T. Christensen, L. J. Munkholm, M. Oelofse, S. Baby and L. Knudsen (2018). The Role of Soil Organic Matter for Maintaining Crop Yields: Evidence for a Renewed Conceptual Basis. Advances in Agronomy, 150: 35-79. [Antonius Schut, Netherlands]	References consulted
8349	47	19	33		Kirkby, C. A., A. E. Richardson, L. J. Wade, G. D. Batten, C. Blanchard and J. A. Kirkegaard (2013). "Carbon-nutrient stoichiometry to increase soil carbon sequestration." Soil Biology and Biochemistry 60: 77-86. Kirkby, C. A., A. E. Richardson, L. J. Wade, M. Conyers and J. A. Kirkegaard (2016). "Inorganic Nutrients Increase Humification Efficiency and C-Sequestration in an Annually Cropped Soil." Plos One 11(5). [Antonius Schut, Netherlands]	References consulted
26509	47	9	47	9	should read: "that subsidized crop" [Aaron Smith, Norway]	Done
7181	47	21	47	21	There are 2 options in Table 6.7 for which the confidence is neither expressed nor reference provided while other options have expressed evidence but no reference. This needs to be explained. Also, consider adding a guidance on how this can be operationalised at regional/local levels? [Debra Roberts, South Africa]	Uncertainty langauge revisited
12781	47	22	47	22	The text in table 6.7 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
5703	47	23	47	24	"increasing soil organic matter content is a measure to address land degradation" better to say land degradation control or reduction! [Sanaz Moghim, Iran]	Done
25607	47	30	48	3	We suggest to illustrate this aspect with figures to be linked with results from 3.6.2 and 4.6 [, France]	All numbers cross references to other chapters
27279	47	21			Please clarify the timeframe to which these numbers of people affected. [, Germany]	Timeframe added
26511	48	3	48	3	should read: "(Vermeulen et al. 2012; Challinor et al. year needed; Lipper et al. 2014; Lobell 2014)" [Aaron Smith, Norway]	Done
25609	48	5	48	5	Crop and animal diversification : We suggest to illustrate this aspect with figures to be linked with results from 3.6.2 and 4.6 [, France]	No space for additional figures
26513	48	7	48	7	"locations of drinking fountains and". Is stock tanks meant by drinking fountain. Drinking fountain is for humans in a building or on the street. [Aaron Smith, Norway]	animal dring troughs
26515	48	13	48	13	should read: "Pretty et al.,(2018) report" [Aaron Smith, Norway]	Done
7887	48	13	48	13	(Pretty et al.,2018) --> Pretty et al. (2018) [Hiroaki Kondo, Japan]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26517	48	14	48	14	"passed a resign threshold". Unclear what is meant by resign [Aaron Smith, Norway]	Should be "design" - changed
25611	48	20	48	25	The roles of forests in soil conservation, as well as water quantity and quality, should be highlighted as adaptation outcomes. [, France]	Mentioned in table 6.4
26519	48	22	48	22	should read: "extreme weather events" [Aaron Smith, Norway]	Done
1943	48	22	48	22	wheatear -> weather. [William Lahoz, Norway]	Done
7889	48	26	48	26	2014) Cohn --> 2014; Cohn [Hiroaki Kondo, Japan]	Done
26521	48	26	48	27	should read: "(Campbell et al. 2014; Cohn et al. 2017)" [Aaron Smith, Norway]	Done
5705	48	36	48	36	"since it makes soil less vulnerable to loss under climate extremes", [Sanaz Moghim, Iran]	this added
26523	48	41	48	41	should read: "topsoil salinization may" [Aaron Smith, Norway]	done
26525	48	42	48	42	should read: "drainage, mulching, and vegetation, all of them" [Aaron Smith, Norway]	done
7183	49	1	49	3	What is the time period being considered here? [Debra Roberts, South Africa]	Time period "during 2001–2010″ is added.
26527	49	9	49	9	should read: "affecting millions of people" [Aaron Smith, Norway]	done
26529	49	12	49	12	should read: "(with the majority in Africa; Bailis" [Aaron Smith, Norway]	Done
7891	49	12	49	13	(with the majority in Africa; (Bailis et al.2015): How to write additional information and reference in parentheses is inconsistent with other part. [Hiroaki Kondo, Japan]	Done
26531	49	25	49	25	should read: "soil stabilization, and" [Aaron Smith, Norway]	Done
26533	49	29	49	29	should read: "acidification, Anenberg et al.(2012) estimated" [Aaron Smith, Norway]	Done
7893	49	29	49	29	(Anenberg --> Anenberg [Hiroaki Kondo, Japan]	Done
7561	49	29	49	36	Additional information related to these measures from Shindell et al 2012 are included in UNEP & WMO (2011) INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE. Additionally, the CCAC is the only global institution working to mitigation SLCPs and a leader in providing routinely updated information on mitigation measures. [Durwood Zaelke, United States of America]	Results reported in UNEP and WMO (2011) are added.
7637	49	29	49	36	Additional information related to these measures from Shindell et al 2012 are included in UNEP & WMO (2011) INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE. [Kristin Campbell, United States of America]	Results reported in UNEP and WMO (2011) are added.
1409	49	29	49	36	Since premature deaths are estimated thnks to extrapolation of morbidity/pollution relationships obtained from specific cohorts to the entire population, some IPCC uncertainty language should be added when presenting such numbers. [Sophie Szopa, France]	The numbers are revised based on UNEP and WMO (2011). This part only listed the numbers with particular references, and IPCC uncertainty language is used in other part.
26535	49	34	49	34	should read: "West et al.,(2013) estimated" [Aaron Smith, Norway]	Done
26537	49	35	49	36	should read: "2030, 2050, and 2100." [Aaron Smith, Norway]	Corrected
2881	49	39	49	39	I think 'storm surge' is only singular. [Luca Castrucci, United States of America]	Corrected
5707	49	39	49	41	It is better to mention the role of coastal wetlands in ecosystem and local climate and biodiversity, any reference! [Sanaz Moghim, Iran]	Crtrected
26539	49	40	49	40	should read: "reducing erosion, and by helping to stabilize shore sediments" [Aaron Smith, Norway]	Corrected
26541	50	9	50	9	should read: "2015), and can potentially" [Aaron Smith, Norway]	Done
7895	50	9	50	9	andcan --> and can [Hiroaki Kondo, Japan]	Done
1945	50	9	50	9	and can. [William Lahoz, Norway]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26543	50	10	50	11	should read: "(for example, trees generally mitigate summer mean warming and temperature extremes) (Findell et al., 2017; Sonntag et al., 2016; Table 6.7)." [Aaron Smith, Norway]	Changed
26545	50	12	50	12	should read: "by stabilizing soils" [Aaron Smith, Norway]	Done
5709	50	15	50	15	"the wider adaptation impacts would likely be negative" negative on what? On food product, good to say that! But positive on climate system! [Sanaz Moghim, Iran]	Reworded to clarify
29691	50	19	50	22	This is a simplistic statement, that bioenergy and BECCS will have adverse side-effects for adaptation. What form / level of bioenergy is this referring to? Bioenergy is already used by many as an energy source. There are examples of bioenergy production that provide additional sources of income and energy security. This section should be made to be consistent with other more balanced sections of this report that also cover bioenergy. [, Saint Lucia]	We have adjusted the text to be more balanced.
39881	50	20	50	20	After "… Smith et al. 2016a) ..." insert ", forestland". Not just cropland but BECCS can also require forestland. It depends on the feedstocks. [, United States of America]	We have added this information
12783	50	26	50	26	The text in table 6.8 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
32623	50	26	50	27	same than previous comment [Marta Guadalupe Rivera-Ferre, Spain]	Done
7897	50	32	50	32	(Kummu et al.,2012) --> Kummu et al. (2012) [Hiroaki Kondo, Japan]	Done
5711	50	36	50	39	any reference for this part! [Sanaz Moghim, Iran]	Corrected
7415	50	9			Separate words 'andcan' [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Done
26547	51	7	51	7	should read: "Food price stabilization by China" [Aaron Smith, Norway]	OK
5713	51	15	51	19	need references! [Sanaz Moghim, Iran]	Accepted. References added where needed
2919	51	24	51	24	In some places in chapter 6 and the SPM this cateogry is referred to as risk management. In others as governance and risk management. The latter is more appropriate and should be used throughout. [David Kaimowitz, Nicaragua]	Language harmonised
12785	51	24	51	24	The text in table 6.9 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
32625	51	24	51	25	If seeds sovereignty can benefit most small farmers worldwide, does not less than 100 millions seems to be an underestimation? [Marta Guadalupe Rivera-Ferre, Spain]	Could be a conservative estimate (100 m), but many smallholders use non-local seeds (improved or hybrids) so we shouldn't count the entire number of smallholders as those benefiting from seed sovereignty
2921	51	26	51	26	This figure of 38 million hectares is absurdly low. There are around 200 million hectares of legally recognized Indigenous forest lands in Brazil alone. In Latin America, Brazil, Colombia, Mexico, Peru, and Bolivia all have large areas of titled Indigenous lands. (Colombia also has large areas of titled collective afro-Colombian lands.) Note: The Garnett et al papers are solid research. The report mis-interprets their findings. [David Kaimowitz, Nicaragua]	We reconsulted Garnett and have used their conclusions on 38 m km2, although this overall section has now moved to Ch 7.4.4
26549	52	3	52	3	should read: "Adger et al. 2011; Thornton" [Aaron Smith, Norway]	Done
26551	52	3	52	3	suggestion: "Surveys of farmers in areas with variable climates" [Aaron Smith, Norway]	Done
26553	52	8	52	8	should read: "It is not clear, however, how" [Aaron Smith, Norway]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32595	52	10	52	17	This section will benefit from drawing attention to some if not all the challenges to Seed sovereignty in developing countries by multinational companies (Scoones, 2008) IAN SCOONES, Journal of Agrarian Change, Vol. 8 Nos. 2 and 3, April and July 2008, pp. 315–344.Mobilizing Against GM Crops in India, South Africa and Brazil Ian Scoones Mobilizing Against GM Crops in India, South Africa and Brazil [Neeraja Havaligi, United States of America]	Reference added
26555	52	28	52	28	should read: "factors" (Birkmann" [Aaron Smith, Norway]	Done
26557	52	28	52	28	should read: "potential realized." [Aaron Smith, Norway]	Done
7899	52	36	52	38	Check the location of parenthesis and period. [Hiroaki Kondo, Japan]	Done
26559	52	37	52	37	should read: "strategy (Platteau et al. (2017) suggest less than…" [Aaron Smith, Norway]	Done
1645	52	39	55	20	There are loads of publications on prevention of desertification in China, e.g. green for grain project. There are not enough discussion on how policcy should be imposed for deserted areas to adapt to climate change. [Xuefeng Cui, China]	Policy is discussed in Chapter 7 - not in Chapter 6
6827	52	39	56	33	The assessment here is not consistent with Chapter 3.7 Responses to Desertification under Climate Change, please revise it to avoid duplication and conflict. [Changke Wang, China]	Harmonised with Chapter 3.7
22841	52	39	59	32	There are several repetitions in sections 6.4.3.1 addressing desertification and 6.4.3.2 addressing land degradation some paragraphs are identical (perhaps due to the fact that desertification is a form of land degradation ? … check also tables 6.10 and 6.13 [Anastasios Kentarchos, Belgium]	Indeed - many of the same drivers contribute to both. Desertification is a form of land degradation
3685	52	41		43	it is difficult to capture the idea how this paragraph differs from 6.3.1 [Cordula Ott, Switzerland]	Indeed - many of the same drivers contribute to both. Desertification is a form of land degradation
7901	53	1	53	1	l12, c4 in Table 6.10: left justification [Hiroaki Kondo, Japan]	Done
12787	53	1	53	1	The text in table 6.10 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
26561	53	6	53	6	should read: "livestock, and grazing" [Aaron Smith, Norway]	Done
5715	53	10	53	11	the same references as previuos sentence, right! [Sanaz Moghim, Iran]	Yes
7903	53	11	53	11	1000 hectares: Isn't this too small? May be 1000 Mha? [Hiroaki Kondo, Japan]	The text already says 1000 million ha
15687	53	12	53	15	Quite straightforward thinking. Would be nice to have more references to the studies giving same range. [Tuomo Kalliokoski, Finland]	All references to this estimate are provided
26563	53	28	53	28	should read: "2015), IPBES (2018)" [Aaron Smith, Norway]	Done
31785	53	41	53	43	Additional reference considering only marginal land for BECCS deployment: M. Fajardy and N. Mac Dowell (2017). Energy Environ. Sci., 11, 1389–1426 [Piera Patrizio, Austria]	The line/page number for this comment seem to be incorrect (there is no line 41 on page 53). We unfortunately are not sure what the reviewer is referring to and have not addressed this comment.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3459	53	18	54	25	Some conclusions in this chapter are contradictory with those in other chapters. So it is suggested that the consistency between chapters be improved through revision. The following conclusions are inconsistent with those in Chapter 3: Lines 18-22, page 53: There is no availability of global studies about the future potential impact of forest management to reverse/halt desertification rates (in terms of area impacted). Most of the available literature sources are based on regional historical trends. For example, it has been simulated that human activity (i.e., land management) contributed to 26% of the total land reverted from desertification in Northern China between 1981 and 2010 (Xu et al. 2018). Lines 25-27, page 54: The global extent of chemical soil degradation (salinisation, pollution, and acidification) is about 103 Mha (Oldeman et al. 1991) giving the maximum extent of land that could benefit from the management of pollution and acidification. [, China]	Now fully cross-referenced with other chapters
7905	54	8	54	8	(Tansey et al. 2004) --> Tansey et al. (2004) [Hiroaki Kondo, Japan]	Done
6829	54	21	54	24	Thailand is not in the dryland area based on UNCCD, where desertification should be land degradation ,but not desertification of UNCCD, in this report the defination of desertification is based on UNCCD defination,please revise it.At local level, in Thailand it was found that the desertification risk reduces when the land use is changed from bare lands to agricultural lands and forests, and from denuded forests to forests; Conversely, the desertification risk increases when converting forests and denuded forests to barelands (Wijitkosum, 2016). [Changke Wang, China]	Text removed
7907	54	25	54	27	More explanation is required for the relationship between this part and desertification. [Hiroaki Kondo, Japan]	accepted. More examples added
5717	54	28	54	29	needs more certainty! presumed! and positive on what? [Sanaz Moghim, Iran]	Clarified that no literature was found - flagged as a data gap
5719	54	34	54	35	can we say this! No impacts! [Sanaz Moghim, Iran]	Done
7909	54	36	54	39	This part should be shifted just after line 27 in this page and may be merged. [Hiroaki Kondo, Japan]	Done
14303	54	32			A more detailed understanding of the role of biochar on water holding and drainage is available. Opportunities exist in Arenosol to increase water retention (by 20%) , or increase drainage in Vertosols. See Quin et al 2015 Quin PR, Cowie AL, Flavel RJ, MacDonald LM, Morris SG, Keen B, Singh B-P, Young IM, Van Zwieten L* (2014) Biochar changes soil structure and water-holding capacity - a study with x-ray µCT. Agriculture Ecosystems Environment 191, 142–149. [Lukas Van Zwieten, Australia]	Literature consulted
12789	55	24	55	24	The text in table 6.11 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
7913	55	26	55	36	No comment is found for reduced food waste. [Hiroaki Kondo, Japan]	Noted and added where applicable
7911	55	30	55	31	'could' is duplicated. [Hiroaki Kondo, Japan]	Done
6831	55	32	55	36	The desertification area is obvious, and please assess the desertification response based on the value chain management at the regional scale. [Changke Wang, China]	Regional analysis is presented in section 6.2.3
12791	56	1	56	1	The text in table 6.12 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6833	56	15	56	20	The literature cannot support this conclusion. The scope of the study is Jinchuan County, Sichuan Province, China. It has a very small range and cannot represent Qinghai-Tibet Plateau , and it is not in dryland regions.and It does not the desertification area indicated by UNCCD. please revised it. Zhang, L., Y. Zhang, J. Yan, and Y. Wu, 2008: Livelihood diversification and cropland use pattern in agro-pastoral mountainous region of eastern Tibetan Plateau. J. Geogr. Sci., 18, 499–509 [Changke Wang, China]	Sentence deleted
3461	56	15	56	20	It cannot be concluded from the literature by "Zhang et al. 2008" as indicated in line 18 that "In Tibet, pastoralist households will little opportunity for diversification tend to overgraze, leading to desertification". This research study is geographically limited to Jinchuan County, Sichuan Province, China, a small area that cannot represent the Qinghai-Tibet Plateau, which is not a dry land, nor a desert land referred to by UNCCD. So it is suggested to delete the conclusion. [, China]	Sentence deleted
10233	56	32	56	33	LUC is not a loss of land [Jean-Luc Chotte, France]	Deleted
8351	57	3	16		Both state and process and cause and effect are confused here. Land degradation is a process that affects the status of organic matter: it cannot be measured and therefore land degradation cannot be a status of a system. The cause of this decline is a lower input of plant material into soils, reflecting a lower productivity (due to e.g. land conversion,mining of soil minerals, salinization, acidification etc). Adressing the status (organic matter) will not do much if the reasons for the decline (poor management) are not adressed. Effectively, if production of biomass and soil C inputs are increased, SOC will follow. Unfortunately, it doesn't work the other way around, at least when only C is added (see comments above). Measurements often confuse the effect of C with the effect of added nutrients. Even extremely mined soils (with yields below 0.5 t/ha) can be restord quickly when clay content is present and proper nutrients are applied (work now under review), really questioning if SOM is as essential as often claimed! [Antonius Schut, Netherlands]	Wording changed to reflect this nuance
12793	57	1	57	1	The text in table 6.13 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
10357	57	11	57	11	Whether here or elsewhere in this chapter where soil nutrient management is mentioned, among the options mentioned should be "Integrated Soil Nutrient Management", which is a strategy of judicious combination of organic and inorganic sources of plant nutrients for managing soil fertility to enhance productivity, minimize the gaseous emissions and reduce leakage of plant nutrients into the environment. [Jean-Luc Chotte, France]	Integrated Soil Nutrient Management is part of improved cropland management and improved grazing land management
10235	57	14	57	15	groundcover is threatened by overgrazing [Jean-Luc Chotte, France]	As already written
7915	57	17	57	20	This part is almost same as the lines 12-15 in page 53. Isn't there any difference between desertification and land degradation for the respond options on land management? [Hiroaki Kondo, Japan]	Similar responses since desertification is a subset of land degdrataion

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25613	57	24	57	36	The role of sustainable forest management to prevent forest degradation (over-logging for example), should be highlighted, including through the use of forest certification. Some references: - Siry, J. P., Cubbage, F. W., & Ahmed, M. R. (2005). Sustainable forest management: global trends and opportunities. Forest policy and Economics, 7(4), 551-561. - Bayol, N., Demarquez, B., De Wasseige, C., Eba'a Atyi, R., Fisher, J. F., Nasi, R., ... & Vivien, C. (2012). Forest management and the timber sector in Central Africa. The Forests of the Congo Basin–State of the Forest 2010, 43-61. - Rametsteiner, E., & Simula, M. (2003). Forest certification—an instrument to promote sustainable forest management?. Journal of environmental management, 67(1), 87-98. [, France]	Forest certification is mentioned in table 6.4 in the context of reducting degradtion . In improved forest managenes section, now added "Forest certification helps prevents forest degradation and over-logging (Rametsteiner and Simula 2003). "
10237	57	25	57	27	reword - ZNLD is the older term for LDN. [Jean-Luc Chotte, France]	Done
1947	57	27	57	27	I suggest removal of "indeed". Avoid needless words. [William Lahoz, Norway]	Done
10239	58	8	58	10	This is internally inconsistent - 1000 ha is a very small area, in global terms, and it conflicts with the first sentence - that salinsation is a widespread problem (as supported by Wong et al cited above - 932 M ha). [Jean-Luc Chotte, France]	corrected
7917	58	10	58	10	'not less than 1000 hectares.': Isn't this too small? Maybe 1000 Mha? [Hiroaki Kondo, Japan]	The text already says 1000 million ha
7919	58	17	58	17	);(--> ; [Hiroaki Kondo, Japan]	Done
10241	58	19	58	19	Griscom presents assessments for 20 specific natural climate solutions - not ecosystem-based adaptation. It is not clear why you have interpreted this paper in this way. [Jean-Luc Chotte, France]	The interventions also have potential for adapation
7921	58	19	58	20	This part seems to be cut corners. At least it should be shown where 'elsewhere in this section' is. [Hiroaki Kondo, Japan]	Cross referencing improved
25615	58	21	58	25	This paragraph should be checked as there are some assessments of forest degradation: - Hosonuma, N., Herold, M., De Sy, V., De Fries, R. S., Brockhaus, M., Verchot, L., ... & Romijn, E. (2012). An assessment of deforestation and forest degradation drivers in developing countries. Environmental Research Letters, 7(4), 044009. - Keenan, R. J., Reams, G. A., Achard, F., de Freitas, J. V., Grainger, A., & Lindquist, E. (2015). Dynamics of global forest area: Results from the FAO Global Forest Resources Assessment 2015. Forest Ecology and Management, 352, 9-20. [, France]	The mitigation numbers are addressed in more detail in Ch 2
10243	58	26	58	26	salinisation alone affects around 1000 M ha, so this is a severe underestimate. [Jean-Luc Chotte, France]	It is a old reference. Other newer added.
40809	58	29	58	30	why are impacts presumed to be positive? [Valerie Masson-Delmotte, France]	Clarified that no literature was found - flagged as a data gap

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14305	58	34	58	36	This statement is perhaps a bit too broad brushed and could be refined with more recent publications looking at impacts across a decade scale field work. Indeed, some of the recently published data (2017 and 2018) from a 10-year replicated biochar field trial on Ferrosol (a key soil across the tropics- eg Brazil) shows that biochar can improve aggregation, which results in a continued stabilisation of new C (eg exudates) (a negative priming effect). This demonstrated mechanism is what can result in improved soil stabilisation and the various benefits that come with it (stability, water retention properties, microbial resilience). The potential for increasing soil C using the positive priming effect resulting from biochar/ improved aggregate stability was conservatively shown (on Ferrosol only) to have potential of increasing soil C storage by 0.03-0.04 Pg C/ y globally. Weng Z (Han), Van Zwieten L, Singh B-P, Tavakkoli E, Joseph S, Macdonald LM, Rose TJ, Rose MT, Kimber SWL, Morris S, Cozzolino D, Araujo JR, Archanjo BS, Cowie A(2017) Biochar built soil carbon over a decade by stabilising rhizodeposits. Nature Climate Change 7, 371-376. Weng Z (Han), Van Zwieten L, Singh B-P, Tavakkoli E, Kimber SWL, Morris S Macdonald LM, Cowie A (2018) The accumulation of rhizodeposits in organo-mineral fractions promoted biochar-induced negative priming of native soil organic carbon in Ferralsol. Soil Biology and Biochemistry 118, 91-96. [Lukas Van Zwieten, Australia]	The biochar text has been revised and harminised with the text in other chapters
7923	58	36	58	36	(Sohi, 202) --> Sohi (2012)? [Hiroaki Kondo, Japan]	Done
10245	58	42	58	43	logic not clear: is this par about preventing LUC from grassland to cropping or about "stabilising degraded soils"? [Jean-Luc Chotte, France]	Wording changed
10247	59	1	59	2	You are assuming implicitly that conversion will continue at same rate. that Is there any forward projection of future conversion rates? [Jean-Luc Chotte, France]	We have not found future projections
7925	59	3	59	3	Tale --> Table [Hiroaki Kondo, Japan]	Done
7927	59	15	59	15	change --> chain? [Hiroaki Kondo, Japan]	Done
12795	59	17	59	17	The text in table 6.14 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
7929	59	22	59	24	No comment on Reduced food waste [Hiroaki Kondo, Japan]	Mentioned in sentence above - now changed from "waste" to "food waste"
25617	59	25	59	27	This paragraph should be checked, as at least for wood products, the areas of forest covered by sustainability schemes can be assessed : FAO FRA 2018 provides some figures. [, France]	But the use of forest products per se is not a measure to benefit land degradation
32627	59	36	59	37	I guess there are no studies, but wonder if seeds sovereignty facilitates crop diversification, intercropping and so on, it is a form to reduce land degradation [Marta Guadalupe Rivera-Ferre, Spain]	While it may be true, we could find no studies to support this statement
12797	59	37	59	37	The text in table 6.15 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
2923	60	1	60	6	Again, these figures are absurdly low. Various RRI publications, including the one cited here and some with WHRC and or WRI, are the best researched estimates. They come to estimates many times higher than 38 million hectares. [David Kaimowitz, Nicaragua]	Should be 38 million km2; figures are now in Ch 7.4.4.
7931	60	7	60	11	The unit of Mha is inconsistent. At line '7 MHa', but '20 million ha' at line 11. [Hiroaki Kondo, Japan]	All changed to Mha
7933	60	16	60	16	160-500m2: Is this value per capita? Is the unit correct? [Hiroaki Kondo, Japan]	Yes per capita. Unit is correct. New ref added
10249	60	16	60	16	per capita? Cite the original source of this estimate. [Jean-Luc Chotte, France]	Yes per capita. Unit is correct. New ref added
8741	60	16	60	17	"160-500 m2" refers to per household or per dweller? [Changxiao Li, China]	Yes per capita. Unit is correct. New ref added

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7935	60	24	60	24	Niger, and (Palacios et al.(2013) --> Niger (Palacios et al. 2013), and [Hiroaki Kondo, Japan]	Done
7937	60	31	60	31	(see above): Show the exact place. [Hiroaki Kondo, Japan]	Done
12799	61	1	61	1	The text in table 6.16 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
1699	61	4	61	6	Despite the fact that soil organic matter has a positve effect on soil fertility, some additional remarks need to be added to the stated relationship between soil organic matter and crop yields to explain the context, namely the following: 1) the relations found by Soussana et al (2018) and Pan et al (2009) might be a correlation, not necessary a causation, as increased crop yields also increase soil organic matter and 2) it is unclear if the increase in crop yields found by Lal (2006) are due to increased nutrient supply or due to other soil fertility aspects. In case the first is the cause, these yield increases due to soil organic matter are only valid in farming systems with low external nutrient inputs. In general however, to increase soil organic matter, additional nutrients also need to be added to the soil (see Van Groeningen et al (2017) "Sequestering soilorganic carbon: A nitrogen dilemma" link: https://pubs.acs.org/doi/pdfplus/10.1021/acs.est.7b01427. [Renske Hijbeek, Netherlands]	Nuance added
1701	61	4	61	6	For the yield effect of soil organic matter excluding effects from macro nutrients, see the following meta-analysis in Europe: https://link.springer.com/article/10.1007/s11104-016-3031-x. For a recent review of 14 meta-analyses on the relationship between soil organic matter and crop yields world wide, see "Evidence review indicates a re-think on the impact of organic inputs and soil organic matter on crop yield" by Hijbeek et al (2018) [Renske Hijbeek, Netherlands]	Nuance added - new reference added
7939	61	5	61	5	'for maize for wheat, rice and maize, respectively,': Confusion of products. Is 'maize' duplicated? [Hiroaki Kondo, Japan]	Corrected
7941	61	14	61	14	'overuse in should' --> overuse should? [Hiroaki Kondo, Japan]	Done
7185	61	14	61	15	Consider rephrasing this part of the sentence. [Debra Roberts, South Africa]	Done
7943	61	27	61	27	Drewry,2006) , Taboada et al. --> Drewry,2006; Taboada et al. [Hiroaki Kondo, Japan]	Done
5721	61	28	61	29	any reference [Sanaz Moghim, Iran]	Done
7945	61	31	61	31	(Erisman et al.,2008) --> Erisman et al.(2008) [Hiroaki Kondo, Japan]	Done
10251	61	33	61	33	reference? [Jean-Luc Chotte, France]	Done
5723	61	33	61	36	this part needs references [Sanaz Moghim, Iran]	Done
10253	61	35	61	36	source? evidence that agroforestry is suitable for all degraded land? [Jean-Luc Chotte, France]	Done
7417	61	18			Number omission, how many million people not specified, text should match Table 6.16 [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Changed to "millions of"
14307	61				Table 6.16 Biochar: Or potentially positive impacts for up to 5 billion people (i.e. population in tropics) who could benefit from enhanced crop production. Why restict this calculation to a single source that looks only at land competition which could be avoided? The calculation should also consider the potential benefits to food production and how many people this could impact. Also the value of 4.2 billion people negatively affected seems unrealistically high. That would be equivalent to everyone in the global south converting their cropland to biomass production. What is the basis for this estimate? [Lukas Van Zwieten, Australia]	More nuanced estimates added

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14309	61				Table 6.16 Bioenergy: Why is this figure is so much lower than for biochar, when exaclty the same mechanism (competition for land to provide feedstock) is assumed? Why is this figure deemed to have "robust evidence, high agreement" compared to "limited evidence, low agreement" for biochar, when the same interaction between land competition and food security is at play? [Lukas Van Zwieten, Australia]	We have revised the estimates of both biochar and bioenergy and updated our confidence levels.
25619	62	1	62	7	Some additionnal material could be founded in the following documents: - Sunderland, T. C. H., Powell, B., Ickowitz, A., Foli, S., Pinedo-Vasquez, M., Nasi, R., & Padoch, C. (2013). Food security and nutrition: the role of forests (No. CIFOR Discussion Paper). Center for International Forestry Research (CIFOR), Bogor, Indonesia. - Dejene, A. (2003). Integrated natural resources management to enhance food security. The case for community-based approaches in Ethiopia. Environment and natural resources working paper, 16. - Sène, E. H. (2000). Forests and food security in Africa: the place of forestry in FAO's Special Programme for Food Security. Unasylva (English ed.), 51(202), 13-18. [, France]	Sunderland et al. was added
5207	62	1	62	7	This paragraph is important because it argues the forests play a major role for ensuring food security. However, the paragraph lacks evidence for the argument and has a problem in the terminology. For example, mushrooms, fodder, fruits, berries are often included in non-timber forest products. And fodder should not be categorized as food for local communities (because the term "local communities" could be a synonym of "local people" for a number of readers, and in this case, fodder is food for livestock). Therefore, we propose following improved paragraph: “There is no availability of global estimates about the effects of forest management and restoration activities on the number of nourished people. Nevertheless, forests play a major role to provide food to local communities, and diversify daily diets directly or indirectly through improving productivity, hunting, diversifying tree-cropland livestock systems, and grazing in forests. For example, in Cambodia, a common strategy for increasing food security taken by rural residents in forested area is a diversification of income sources by combining farming with collections of non-timber forest products (such as wild fruits, lianas and vines, medicinal plants, wild vegetables, mushrooms, bamboo shoots, natural resins, etc.) for self-consumption as well as for cash income (Ehara et al., 2016). Managed natural forests, shifting cultivation, agroforestry systems are demonstrated to be crucial to food security and nutrition of hundreds of million people in rural landscapes worldwide (see Vira et al., 2015).” Added reference: Ehara et al, 2016. Identifying characteristics of households affected by deforestation in their fuelwood and non-timber forest product collections: Case study in Kampong Thom Province, Cambodia, Land Use Policy, 52, pp.92-102, https://doi.org/10.1016/j.landusepol.2015.12.006. [, Japan]	This section is about assessing the global potential of land management options to address food security. Despite interesting by contents, the contribution by Ehara et al. (2016) does not provide global or local estimates of the potential contribution of sustainable forest management and forest restoration to secure nutrition and address food security, even because the main aim of the paper is "to identify characteristics of households affected by deforestation in their fuelwood and NTFP collections within 5 years, particularly paying attention to the change in forest area around their villages, and to determine policy implications for forest development and conservation at a provincial level". Neverthless, the suggestion to reformulate the sentence is welcome, and now the sentence reads: "Forests play a major role to provide food to local communities (non-timber forest products, mushrooms, fodder, fruits, berries, etc.), and diversify daily diets directly or indirectly through improving productivity, hunting, diversifying tree-cropland-livestock systems, and grazing in forests. Based on the extent of forest contributing to food supply, considering the people undernourished (Rowland et al. 2017; FAO, IFAD, and WFP, 2013), and the annual deforestation rate (Keenan et al. 2015), the global potential to enhance food security is large positive for improved forest management and small positive for reduced deforestation (Table 6.45). For example, managed natural forests, shifting cultivation, agroforestry systems are demonstrated to be crucial to food security and nutrition of hundreds of million people in rural landscapes worldwide (see Vira et al., 2015). ".
32629	62	7	62	7	recommend look Shackleton 2014: Impacts of Climate Change on Food 2 Availability: Non-Timber Forest Products. In Handbook of Global Environmental Pollution. Springer. [Marta Guadalupe Rivera-Ferre, Spain]	not able to access the reference.
40145	62	7	62	7	recommend look Shackleton 2014: Impacts of Climate Change on Food 2 Availability: Non-Timber Forest Products. In Handbook of Global Environmental Pollution. Springer. It is available at the DMS [Marta Guadalupe Rivera-Ferre, Spain]	See comment above
10255	62	15	62	15	250kg/yr: source? [Jean-Luc Chotte, France]	Corrected

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10257	62	29	62	30	the cited paper does not include this statistic. Provide clear explanation and evidence for the link between EbA and food security. [Jean-Luc Chotte, France]	New references used
25621	62	31	62	35	More material can be found in : - Kissinger, G. (2011). Linking forests and food production in the REDD+ context. - Visseren-Hamakers, I. J., McDermott, C., Vijge, M. J., & Cashore, B. (2012). Trade-offs, co-benefits and safeguards: current debates on the breadth of REDD+. Current Opinion in Environmental Sustainability, 4(6), 646-653. - Nepstad, D., Irawan, S., Bezerra, T., Boyd, W., Stickler, C., Shimada, J., ... & Azevedo, A. (2013). More food, more forests, fewer emissions, better livelihoods: linking REDD+, sustainable supply chains and domestic policy in Brazil, Indonesia and Colombia. Carbon Management, 4(6), 639-658. - Huettner, M. (2012). Risks and opportunities of REDD+ implementation for environmental integrity and socio-economic compatibility. Environmental science & policy, 15(1), 4-12. [, France]	This section (i.e. 6.4.5.1) is about assessing the global potential of land management options to address food security, in terms of the number of (affected) nourished people (see Table 6.3, page 42). None of the suggested publications explicitly outlines the number of nourished people as the result of reduced deforestation and forest degradation (as stated at lines 31-32, page 62).
1411	62	36	62	40	The numbers seems to be based on a single modelling study. The calibrated unecrtainty language should be used. [Sophie Szopa, France]	Revised using more references and reanalysis
5725	62	38	62	40	it is not clear! Grain consumption! Tonnes! Equivalent! [Sanaz Moghim, Iran]	Revised using more references and reanalysis
14311	63	4	63	5	There are 630 Mha cropland in the troopics (derived from Ramankutty, N., A.T. Evan, C. Monfreda, and J.A. Foley (2008), Farming the planet: 1. Geographic distribution of global agricultural lands in the year 2000. Global Biogeochemical Cycles 22, GB1003) A 25% increase in yield, under the same assumption used below of 4 t/ha/yr grain yield equates to an additional 630 Mt grain/yr - enough to feed 2.5 billion people. To describe this as "moderate" is misleading, as is the use of the term "small co benefits" to describe this on page 79 of this chapter. Given that this can be achieved without removing any cropland from production (Woolf et al. 2010), the overall impact on food security would be a strong positive impact - not the strong negative impact that it is incorrectly described as in this chapter (in this section, also in section 6.5.1.20 and in Table 6.19) [Lukas Van Zwieten, Australia]	New values now used
7947	63	6	63	6	(Chapter 5; Sohi,2012), These --> (Chapter 5; Sohi,2012). These [Hiroaki Kondo, Japan]	Done
7949	63	8	63	8	Smith (2016): Which Smith (2016), 2016a or 2016b? [Hiroaki Kondo, Japan]	Corrected
10259	63	8	63	14	This inappropriately negative assessment ignores the fact that Woolf's analysis, on which the Smith figures are based, assumed biomass crops for biochar would be grown only on abandoned and degraded land not used for other purposes, to avoid competition with food production and negative biodiversity impacts. This is also a misquote of Smith (2016) that states that 40-260 Mha would be required to deliver 0.3 GtCeq/yr ie 1.1 GtCO2e/yr abatement (with the remainder of Woolf's estimate being obtained from sustainably-harvested residues). [Jean-Luc Chotte, France]	Reworded to clarify
7951	63	15	63	15	400 Ma --> 400 Mha? [Hiroaki Kondo, Japan]	Done
7953	63	19	63	19	(Clark and Tilman 2017)) --> (Clark and Tilman, 2017) [Hiroaki Kondo, Japan]	Done
25657	63	22	63	23	A better distinction should be made between afforestation and reforestation, particularly with regard to food security issues. See GENERAL COMMENT ON AFFORESTATION AND REFORESTATION. [, France]	This is now implemented

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25623	63	22	63	28	This paragraph should better reflect that land-based mitigiation options can also generate cobenefits of sustainability, including food security. It's particularly true for degraded land and for mangroves See GENERAL COMMENT ON CDR AND SUSTAINABILITY. For degraded lands, see section 4.7.3 pages 4-40 to 4-41. See also other scientific references such as: - Smith, P., Haberl, H., Popp, A., Erb, K. H., Lauk, C., Harper, R., ... & Masera, O. (2013). How much land-based greenhouse gas mitigation can be achieved without compromising food security and environmental goals?. Global change biology, 19(8), 2285-2302. [, France]	The text now includes a summary of food supply from forests.
10261	63	26	63	28	reforestation means land use change from non-forest (usually agriculture) to forest, on land that has been forested in the historical past. S So it is very likely to displace agriculture and impact food security directly, as recently-cleared land is often highly productive. [Jean-Luc Chotte, France]	This is acknowledged, but to a lower extent than afforestation
5727	63	26	63	28	I believe the reason is not valid! [Sanaz Moghim, Iran]	This is consolidated, and advocated by many other comments
7955	63	30	63	30	wheat; (Clark and Tilman --> wheat; Clark and Tilman [Hiroaki Kondo, Japan]	Done
7957	63	31	63	31	beef/mutton; (Clark and Tilman --> beef/mutton; Clark and Tilman [Hiroaki Kondo, Japan]	Done
7419	63	36	63	39	Related to spreading minerals, there is literature on addition of minerals to pasture and the common lack thereof, for example selenium for livestock to prevent muscle wasting and increase liveweight (https://europepmc.org/abstract/med/473499; http://www.publish.csiro.au/cp/AR9610927; https://link.springer.com/article/10.1007/BF00749690) [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Nuance added
7959	63	41	63	41	2014b) Popp --> 2014b; Popp [Hiroaki Kondo, Japan]	Done
7961	63	42	63	42	Wise et al. 2009) Only --> Wise et al. 2009). Only [Hiroaki Kondo, Japan]	Done
10263	63	42	63	44	this is based on a paper shown as being "in review". This is a total inadequate basis for concluding that there is robust evidence and high agreement for this impact. [Jean-Luc Chotte, France]	We have added more studies and adjusted the confidence level.
14313	63	8			This self citation here should be removed. While there may be some calculations around the purpose of grown biomass for biochar production, the accepted use of biomass for biochar production is from low value, or waste biomass. [Lukas Van Zwieten, Australia]	The cited reference is relevant. It is not correct to say that the accepted use of biomass for biochar production is from low value, or waste biomass
12801	64	4	64	4	The text in table 6.17 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
10265	64	12	64	13	It is not clear how promotion of value-added products will mitigate undernourishment. [Jean-Luc Chotte, France]	The section is focused on the 'Potential of the integrated response options for addressing food security' not mitigation. Promotion of value-added products have the potential to impact undernourishment.
7963	64	16	64	16	al.,2010 ; (Darnton-Hill --> al.,2010 ; Darnton-Hill [Hiroaki Kondo, Japan]	Done
25625	64	32	64	34	Further material could also be found in: - Lang, T., & Barling, D. (2012). Food security and food sustainability: reformulating the debate. The Geographical Journal, 178(4), 313-326. - Garnett, T. (2014). Three perspectives on sustainable food security: efficiency, demand restraint, food system transformation. What role for life cycle assessment?. Journal of Cleaner Production, 73, 10-18. - Irani, Z., & Sharif, A. M. (2016). Sustainable food security futures: perspectives on food waste and information across the food supply chain. Journal of enterprise information management, 29(2), 171-178. [, France]	Material consulted. Thanks.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10267	64	35	64	37	logic not clear. how will people without access to clean energy benefit from energy efficiency? Are you talking about increased efficiency in traditional biomass systems? Or providing access to renewable energy sources (which is not an energy efficiency measure) [Jean-Luc Chotte, France]	They could benefit via improved access to clean energy.
12803	65	4	65	4	The text in table 6.18 is too small [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Done
3487	65	22	65	24	The reference should be Chen (2007). [Jianqi Sun, China]	OK
25627	66	4	66	4	We suggest that the level of confidence between the different statements given in the executive summary of this chapter and the statements contained in section 6.5 be made more consistent. [, France]	Uncertainty langauge revisited
7965	66	7	66	7	(were possible): Is this necessary here? [Hiroaki Kondo, Japan]	Should be "where possible"
7967	66	26	66	26	my --> may [Hiroaki Kondo, Japan]	Done
18131	66	26	66	26	which in turn may include increasing soil carbon stocks. [Vladimir Romanenkov, Russian Federation]	Wording changed to reflect this
10269	66	39	66	39	This is an important conclusion. As all options have some tradeoffs we may need to accept some tradeoffs on implementation. This point must be more strongly reflected in the exectutive summary as it is a major conclusion of this study that there are tradeoffs everywhere but very different amongst options. So, while there is a need to accept some tradeoffs a careful selection may help to avoid large tradeoffs. [Jean-Luc Chotte, France]	Wording changed
3301	66		92		Section 6.5 was very clear and easy to read with graphic-like Tables that helped to aid understanding. [Viola Heinrich, United Kingdom (of Great Britain and Northern Ireland)]	Thank you for these positive comments
21577	66	4			In section 6.5, wherever you cite sections from other chapters, please cite specific subsections to allow traceability - and please double-check with the other chapter that this section is still there when the drafts are finalised, and that the section still provides the information you are referring to. Also, please make every effort as part of cross-chapter coordination to ensure that where chapter 6 claims a co-benefit or trade-off, the relevant sectoral chapter (2-5) has a supporting discussion, so we avoid chapter 6 and those other chapters creating parallel and in some cases inconsistent universes. [Andy Reisinger, New Zealand]	Cross referencing improved
22843	66	39			This is an important conclusion. As all options have some tradeoffs we may need to accept some tradeoffs on implementation. This point must be more strongly reflected in the exectutive summary as it is a major conclusion of this study that there are tradeoffs everywhere but very different amongst options. So, while there is a need to accept some tradeoffs a careful selection may help to avoid large tradeoffs. [Anastasios Kentarchos, Belgium]	Wording changed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8353	66				The first reponse should be improved biomass and food production on existing farmlands. This will result in the co-benefit of more C in farmland soils, focussing on more C in soils is expensive and will do little for food production and for net sequestration. The important role of wetland areas and peatlands for long term C storage has not received sufficient attention. Prevent oxidation of peat is a major source of C and must be adressed, the only feasible option is re-wetting these areas that also turns them into net sinks. These are also the areas where important co-benefits can be obtained: strong C retention and biodiversity improvements. Reducing the need for using peatlands for agriculture requires more efficient use of current cropp- and grasslands in dryland areas, calling for better management and proper nutrient additions to increase biomass production. Increasing C on drylands will be very costly, resulting in continued expansion of agriculture in forrested areas, use of peatlands and drying of wetlands and mangrove systems that are very important for C storage. [Antonius Schut, Netherlands]	Increased food production is ranked among the most effective options across all the land callenges. C strorage across all ecosystems has been addressed in the final draft
25117	67	1	67	13	Text fonts are too small [Junguo Liu, China]	Corrected
10271	67	5	67	5	Figure is not very clear and has no added value to the text [Jean-Luc Chotte, France]	Replaced with bar chart figure
30589	67	5	67	6	Innovative figure, but not sure how easily readable this is. Added value of it? Maybe a matrix-type figure would be easier to understand. [Albrecht Ehrensperger, Switzerland]	Replaced with bar chart figure
7969	67	5	67	7	Figure 6.6: This figure is not easy to understand. For exampl, light blue color is used for BECCS in M region in (b). However, Table 6.19 indicates the co-benefit for Mitigation by BECCS is very large. Why isn't the color deep blue? [Hiroaki Kondo, Japan]	Replaced with bar chart figure
1949	67	5	67	7	I suggest the authors increase the font in Fig. 6.6. Same for Table 6.19. [William Lahoz, Norway]	Done
22845	67	5	67	13	The figure is confusing with a lot of information and strange combinations eg BECCS in the same list as reduced deforestation and avoided conversion of peatlands looks counter-intuitive. [Anastasios Kentarchos, Belgium]	Replaced with bar chart figure
5209	67	5	67	13	Please explain how integrated assessment of the magnitude of co-benefits and adverse side effects incurred by each response option was conducted in Figure 6.6, as in general, the magnitude of co-benefits and adverse side effects vary from option to option and issue to issue. [, Japan]	Replaced with bar chart figure
5211	67	5	67	13	According to section 6.4 and subsection 6.5.2.6, "improved food transport and distribution" has co-benefits with mitigation and food security, and there are no global estimates about its impact on adaptation, desertification, and land degradation, but this seems to disagree with the information provided in Table 6.6. [, Japan]	Replaced with bar chart figure
10273	67	5	67	13	why is improved food transport and distribution negative for mitigation? [Jean-Luc Chotte, France]	Replaced with bar chart figure
15689	67	8	67	8	Figure 6.6 Not really informative figure. How the shape and dimensions of each challenges have been determined and do they have some importance for the interpretation? [Tuomo Kalliokoski, Finland]	Replaced with bar chart figure
25629	67	14	67	14	This typology of forest activities is not consistent with those used in chapter 2 and chapter 4, for example. We suggest that an additional effort be made to strengthen consistency within the report in how different forest activities are considered, in particular by using the same typology from one chapter to another. See GENERAL COMMENT ON THE TYPOLOGY OF FOREST ACTIVITIES. [, France]	Coordination among chapters was implemented
27281	67	14	92	30	Tables of sections 6.5.1, 6.5.2, and 6.5.3: Please see our comment on this table in the SPM. [, Germany]	Dealt with this comment in SPM

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5213	67	14	92	30	Suggest mentioning that the magnitude of co-benefits and adverse side effects are based on global estimates and that the white areas mean not only no/negligible impacts but also no global estimates of impacts in Tables 6.19, 6.20 and 6.21. [, Japan]	Done
22847	67	5			Figure is not very clear and has no added value to the text [Anastasios Kentarchos, Belgium]	Replaced with bar chart figure
3687	67	14			reconsider title: to give guidance to the reader better write: Managing Integrative Response option.... Repeat this in all following chapters [Cordula Ott, Switzerland]	Corrected
6955	67				Figure 6.6 re: dark brown area: It is disconcerting to see reforestation, afforestation, reduced deforestation etc lumped together with BECCS in one major 'adverse side-effects for food security' box. Someone coming to this report briefly, will stop at the figures, and will stop at the dark brown area, and draw the conclusion: these options are all no-go high-regret options. Which they are not. Re/afforestation can have great benefits for food security, eg as agroforestry, or through the ability of trees to improve local ecology. Perhaps the caveat is "if implemented badly" or something like that? Can this be reflected in the figure somehow? - it is not intuitive to see an interaction matrix in the form of a venn diagram. A cross-tabulated matrix with rows and columns is more intuitive. The venn diagram is very elegant, but difficult to interpret. A simple tabular matrix would avoid several different options with different pros and cons appearing in the same box. [Debra Roberts, South Africa]	Replaced with bar chart figure
15691	68	3	68	3	Table 6.19 Really difficult table. What is the value of this kind of table? Giving the message that many things have effect on many things. So? Connections between different things are too difficult to grasp. [Tuomo Kalliokoski, Finland]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25659	68	3	68	4	We believe that this figure is relevant and justified, and we suggest to improve it by adding two columns for biodiversity and water to also assess the impacts of each option on them (for example, using three elements: -, 0, +). We also suggest the following considerations: • Increasing soil organic matter content or reducing losses of organic matter from soils will also largely contribute to adaptation of agriculture to climate change (e.g. reducing erosion, increasing water storage/content in soils...). The arrow “Adaptation” for “Increased soil organic matter” should be larger. • “Behavioural barriers” item should be added to “Improved cropland management”. • Improved grazing land management seems to cover also natural ecosystems. “Natural systems” item should be added to the column “Sectors” • Bioenergy and BECCS should be presented as costly options (SR15). Three coins should be added in the column “Costs”. • Sustainable forest management contribute to adapt forests to climate change and involve natural systems. A large positive arrow should added in the cell “Adaptation”, and the “natural systems” item should be added in the column “Sectors. • Biochar has a high mitigation potential locally but as it requires a lot of biomass to be processed (and thus produced) this means that the global potential is to be reduced. The arrow show be less large. This will also be consistent with the following sections of the report: lines 25-30 page 1-33, Table ES 2.1 page 2-6, lines 31-42 page 4-86. See GENERAL COMMENT ON BIOCHAR. • We suggest to add, below biochar, a line about organic waste recycling (e.g. manure, composts) that is mentioned in chapter 2 and 4. Recycling of organic waste is able to improve soil fertility and soil organic matter and to generate strong cobenefits in mitigation, adaptation, land degradation and food security. Large positive arrows should be added to the columns of these challenges. • Concerning “crop insurance”, further explanations should be provided on the costs, including the relevant stakeholders. With regard to insurance, could you confirm that the idea is if insurances are provided by private companies then this will cost less for States? See GENERAL COMMENT ON INSURANCES • Agricultural practices behind improved xxx or management of xxx should be detailed, for instance in the §B5.2. Why isn't it sustainable instead of improved? See GENERAL COMMENT ON DETAIL OF THE PRACTICES • The words “and others agroecological practices” should be added to “agroforestry”. [, France]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table
13197	68	3	68	5	Table 6.19 some icons are too complex to easliy pick out. [David Cooper, Canada]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table
13199	68	3	68	5	Table 6.19. I would challenge some of the assessments of benefits/adverse effects under MADLF in Table (A). Reduced deforestation, management of invasive species, restaroation of wetlands and peatlands, will each have co-benefts for A, and L, some for D. More detailed comments under Chapter 6. [David Cooper, Canada]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table
39883	68	4	68	5	In Table 6.19, Bioenergy and BECCS lists one crown for cost ("Low Cost"). BECCS is contingent on CCS, which is currently cost-prohibitive and technology-dependent. This should be listed, at a minimum, high cost or variable cost, since some aspects of costs are TBD. [, United States of America]	Agrees that restoration of saline is expensive. But if farmers don't alternative use of saline land or if they don't have alternative liveihoods, they would need to invest in the expensive desalinization strategy. Also agree that integration of biochar in agroforestry systems is more efficient
17239	68	4	68	5	Suggest to check consistency of the option name between Table 6.2 and 6.19; i.e. "reduced deforestation" vs "reduced deforestation and degradation" etc. [Hoang Anh Le, Vietnam]	All options were consistently named across the report.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30109	68	5	68	5	As explained in more detail in other comments it would be more appropriate to use a double arrow for food security for the options 'Reforestation', 'biochar', 'Restoration and avoid conversion of peatlands', 'afforestation' , and most of all ' bionenergy and BECCS'. For the last option it als holds for desertification and land degradation. These changes would imply some rephrasing in the subsections that deal with these options. [, Netherlands]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table
911	68	3	73	9	Sustainable Forest Management (SFM) is depicted in the Table 6.19 and in sub-paragraph 6.5.1.7 (Page 72, Line 6 to Page 73, Line 9) as having no co-benefits of Adaptation and Food Security. This may not be correct. It is difficult to separate mitigation and adaptation in forest sector. If the mitigation service improves because of better management resulting in more biomass production thereby increasing the carbon service, the flow of goods and services from forest will also increase, may be not in the same proportion as major share of the annual increment will contribute towards mitigation, but the remaining smaller part will contribute towards adaptation by improving availability of food supplement, fuelwood, fodder and grazing to the communities. Also, improvement in forest stocks would improve co-benefits of water, soil fertility and soil conservation contributing to improved adaptation. Thus, SFM contributes not only to mitigation, but to adaptation and food security. Absence of scientific studies on this aspect should not be used to deny the co-benefits of adaptation and food security from SFM. [Jagdish Kishwan, India]	This has been revised, and the interlinkages with adaptation and other land challenges added.
33769	68	4	92	30	Tables 6.19, 6.20 and 6.21 indicate witch interventions are hampered by saturation and reversibility. However, there seems to be various forms of saturation which should be distinguished. For soil organic carbon, soil sequestration may be limited by an absolute/finite threshold. In this case, the capacity may be saturated once and for all. Such one-off saturation seems to arise because soil sequestration is a compensation for stock emissions elsewhere (either from fossil sources or LUC). When such saturation is reached there is no more capacity. For most other interventions, the saturation is of a less fundamental character. For instance, room for improvements in diets or food waste may also be limited or saturated. However, the results for climate are not one-off, rather they come repeatedly. This fundamental difference is the case because the latter goes directly to the source of the problem. Therefore, you may consider to differentiate between saturation in absolute terms and saturation in relative terms in the tables. We generally propose that saturation in absolute terms is the case mostly for management of CO2 as opposed to methane. This picture would have been much clearer if the report, particularly ch. 1, provided a clearer picture of the fundamental differences between fossil emissions (which are cumulative in nature and can be characterised as stock emissions) compared to impacts from land use which are circular. [, Norway]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21579	68	5			Table 6.19: even though the legend includes a bidirectional arrow, it is almost never used. I think this is a mistake, and the authors should consider using bi-directional arrows in a more nuanced way (e.g. big arrow up, small arrow down, could mean "mostly strongly co-beneficial, but can have trade-offs in some contexts"). As it stands I feel that the arrows are not nuanced enough and cannot be defended as absolute statements. E.g. "improved food productivity" may or may not deliver on mitigation, depending on what happens to total food production as a result. Agroforestry may or may not support food security, depending on whether food production is maintained or decreased as a result of increasing tree cover. Why does reduced deforestation not have a small negative effect on food security (foregone food production from newly deforested land)? It's always challenging to summary complex and context-dependent solutions in general, and while I in principle think the authors have done a great job in creating this table, more nuance will make it more robust and increase its chances of being a key outcome from this report that can be included in the SPM. [Andy Reisinger, New Zealand]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table
14315	68	5			The text discusses opportunities for increasing soil water content- potentially a climate adaptation tool for less reliable rainfall, yet this is not reflected here. I would suggest a small potential benefit. It is also perplexing that food security is lowered, where many publication suggest improvement in food security due to improved soil condition, greater soil C, and many meta analyses showing greater productive on average. This negative impact seems to be driven by a few desktop studies suggesting food production land is used to grow biomass for biochar production- this is cherrypicking data and needs to be addressed. Biochar production is likely to always be from waste residues- unlike for example bioethanol production. This could be a caveat that could be explained in this report (it is an ideal publication to stress this point). [Lukas Van Zwieten, Australia]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table
10275	68				Table 6.19 Managing salinity is expensive . As discussed above the large negative impact on food security for biochar is not well-founded. Biomass production for biochar or bioenergy can be integrated with ag and forestry systems, giving beneficial impacts on production, and for climate change adaptation. [Jean-Luc Chotte, France]	Agrees that restoration of saline is expensive. But if farmers don't alternative use of saline land or if they don't have alternative liveihoods, they would need to invest in the expensive desalinization strategy. Also agree that integration of biochar production in agroforestry systems is more efficient.
7971	69	1	69	1	These symbols are not always comprehensible.Particularly, Food in key for sector, Saturation and Reversibility in key for saturation and reversibility, and Biophysical and Technological in key for barriers. [Hiroaki Kondo, Japan]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table
21581	69	2	69	21	You could spell out more clearly that because of the difficulty with MRV, it is very hard to create a financial reward for the mitigation effect of increasing soil carbon beyond the co-benefits it brings, meaning that its economic potential is unlikely to be realised until MRV capacity and price-based policies are in place. Also clarify please whether you main soil organic matter or soil organic carbon. [Andy Reisinger, New Zealand]	Lower cost MRV is on the way - this need not be a barrier - clarified SOC vs SOM
10277	69	4	69	5	see comments above on this - some disagreement in the literature re realistic potential [Jean-Luc Chotte, France]	Reflected in the range
23507	69	4	69	12	what is the huge, moderately equal-quantity demarcation point in the text determined? [Huai Jianjun, China]	Reworded
23589	69	4	69	12	what is the huge, moderately equal-quantity demarcation point in the text determined? [Huai Jianjun, China]	Reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
18133	69	12	69	14	There are few adverse side-effects across the challenges (Bustamante et al. 2014b;Smith 2016a) as long as soil organic matter sinks are not increased by methods that increase the emissions of other greenhouse gases (Liao et al. 2016). Need to be re-formulated. [Vladimir Romanenkov, Russian Federation]	Wording improved
10279	69	15	69	16	note however the literature that suggests that the cost of providing the nutrients that are tied up in organic matter is disproportionately high, relative to the value of C credits at current C prices. Note also the dilemma of "using or hoarding" SOM (eg Janzen, H.H., 2006. The soil carbon dilemma: Shall we hoard it or use it?. Soil Biology and Biochemistry, 38(3), pp.419-424.; Sarker, et al., 2018. Impact of agricultural management practices on the nutrient supply potential of soil organic matter under long-term farming systems. Soil and Tillage Research, 175, pp.71-81. [Jean-Luc Chotte, France]	Nuance added
7973	69	18	69	18	capacity; (Bustamante --> capacity; Bustamante [Hiroaki Kondo, Japan]	Done
7975	69	19	69	19	farmers; (Reichardt --> farmers; Reichardt [Hiroaki Kondo, Japan]	Done
40811	69		69		Paragraphs to provide links between pictograms in synthesis figure and underlying literature. Missing = assessment of level of scientific understanding / confidence through analysis of evidenc e/ agreement in paragraphs. [Valerie Masson-Delmotte, France]	Now shown in new tables
7977	70	1	70	1	6.4.4.1; (Labrière --> 6.4.4.1; Labrière [Hiroaki Kondo, Japan]	Done
7979	70	5	70	5	(Smith 2013) --> ; Smith 2013) [Hiroaki Kondo, Japan]	Done
7981	70	9	70	9	2009; (Bustamante --> 2009; Bustamante [Hiroaki Kondo, Japan]	Done
7983	70	10	70	10	inhibitors; (Singh --> inhibitors; Singh [Hiroaki Kondo, Japan]	Done
7985	70	11	70	11	frameworks; (Madlener --> frameworks; Madlener [Hiroaki Kondo, Japan]	Done
7987	70	12	70	12	knowledge; (Reichardt --> knowledge; Reichardt [Hiroaki Kondo, Japan]	Done
12977	70	18	70	18	Using a different climate metric for methane would significantly increase or decrease this mitigation potential. There is no agreed conversion to generate GtCO2-eq yr-1. For instance the methane metrics in IPCC WG I AR5 table 8.7 vary by a factor of 20. [William Collins, United Kingdom (of Great Britain and Northern Ireland)]	We use the agreed value for national greenhouse gas inventories
7989	70	21	70	21	6.4.3.1; (Archer --> 6.4.3.1; Archer [Hiroaki Kondo, Japan]	Done
7991	70	35	70	35	communities (Herrero --> communities; Herrero et [Hiroaki Kondo, Japan]	Done
32181	70	16			"Improved livestock management provides moderate co-benefits for climate mitigation by reducing greenhouse gas emissions can be complemented by inserting the following text "and also by the use of renewable energies and an efficient environmental control and lighting in livestock and poultry housing". [Francisco Javier Hurtado Albir, Germany]	Renewable energies such as wind and solar are not incuded in the scope of this report
7993	71	6	71	6	6.4.3.1; (Archer --> 6.4.3.1; Archer [Hiroaki Kondo, Japan]	Done
7995	71	11	71	11	content; (Smith --> content; Smith [Hiroaki Kondo, Japan]	Done
5729	71	12	71	13	can we say with discontinuity, the impacts cease! [Sanaz Moghim, Iran]	Wording changed
7997	71	17	71	17	inhibitors; (Singh --> inhibitors; Singh [Hiroaki Kondo, Japan]	Done
7999	71	20	71	20	communities (Herrero --> communities; Herrero et [Hiroaki Kondo, Japan]	Done
8003	71	21	71	38	The terms related to benefit such as 'large co-benefit' are not bold and italic type in this part. [Hiroaki Kondo, Japan]	Done

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30591	71	23	71	38	It seems a bit strange that in the case of intensification it is being made clear that it has to be sustainable, whereas for the other options this is not part of the equation. Even though the terms used in the other options - such as "management", "prevention", etc. point to their sustainability orientation, one could still argue that e.g. agricultural diversification could as well be done in a non-sustainable manner. [Albrecht Ehrensperger, Switzerland]	Now changed back to "sustainable intensification" as in FOD
40147	71	23	71	38	Clearly sustainable intensification cannot have negative impacts, otherwise would not be sustainable . However, there is a lot of criticism to the proposal, and it is may be worthy to clarify this. Here or somewhere else in the chapter. I also question the example in the education sayin educational needs of women, since this depends again on what we understand by sustainable intensification. For instace, intercropping is a measure of sustainable intensification which allows to increase productivity, and many women in many places of the world are the ones who practice it and have knnowledge on which crops can be intercropped.. This, if using this example may be worthy to clarify which sustainable intensification practice its referred to and in which context. [Marta Guadalupe Rivera-Ferre, Spain]	Now changed back to "sustainable intensification" as in FOD
8001	71	26	71	26	6.4.3.1;(Dai --> 6.4.3.1; Dai [Hiroaki Kondo, Japan]	Done
14317	71	21			While the notion of increasing food productivity ticks all of the boxes, it is too good (unfortunately) to be true. Sustainable increases in food production can only come through genetic advances in crops, improved access to water and farm infrastructure and improvements to soil condition and fertility. All of these come with a greenhouse foot print, including the use of legumes to increase N fertility. Potential for soil GHG emissions remains high with any form an N addition to soil. Opportunities to lower soil GHG emissions through the use of biochar have not been cited in this section: eg Cayuela ML, Van Zwieten L, Singh BP, Jeffery S, Roiga A., Sánchez-Monederoa MA (2014) Biochar's role in mitigating soil nitrous oxide emissions: A review and meta-analysis. Agriculture Ecosystems and Environment 191, 5–16. [Lukas Van Zwieten, Australia]	There are many routes to sustainable intesnification other than those listed
8005	72	4	72	4	et al., 2011; (Mbow --> et al., 2011; Mbow [Hiroaki Kondo, Japan]	Done
8007	72	8	72	8	Section 6.4.3.1; (Ramachandran --> Section 6.4.3.1; Ramachandran [Hiroaki Kondo, Japan]	Done
21583	72	10	72	13	This text is a good example why bi-directional arrows are important: the text says that agroforestry could reduce food production or could increase it. Of course, the co-benefits are large if it increases is, but that doesn't make the potential for food production to decrease go away. Yet the arrow in the table only points to a big co-benefit, which is highly misleading and inconsistent with the text that the table is meant to summarise. [Andy Reisinger, New Zealand]	This is based on the available litterature assessed on the topic.
10281	72	10	72	14	here you have assumed the best outcome - implementation of agroforestry that benefits food production, while for biochar and bioenergy you have assumed the worst outcome. This inconsistency between the options is unacceptable., [Jean-Luc Chotte, France]	This is based on their relative importance in contributing to food production
10283	72	16	72	16	depending on how it is implemented. Establishing trees from seedlings - including purchase of seedlings and ground preparation - can be a cost barrier for smallholders. [Jean-Luc Chotte, France]	Corrected
27283	72	23	72	35	Why are the co-benefits of SFM for mitigation mentioned in lines 34-35 not included in the figure in line 23? Please change or give explanation in text. [, Germany]	This is now quantified and reflected in table 6.54

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25631	72	29	72	32	The current knowledge on adaptation in forest management could be highlighted. See in particular : - Keenan, R. J. (2015). Climate change impacts and adaptation in forest management: a review. Annals of Forest Science, 72(2), 145-167. [, France]	The suggested reference is interesting but not useful for the purpose of the section, since it does not provide data or robust estimates "to quantify the impacts of sustainable forest management and forest restoration on adaptation"
8009	72	29	72	35	Isn't the line 29-30 conflicting with the line 35? [Hiroaki Kondo, Japan]	The sentence has been revised
25633	72	35	72	36	Further material can be found in: - Sunderland, T. C. H., Powell, B., Ickowitz, A., Foli, S., Pinedo-Vasquez, M., Nasi, R., & Padoch, C. (2013). Food security and nutrition: the role of forests (No. CIFOR Discussion Paper). Center for International Forestry Research (CIFOR), Bogor, Indonesia. - Smith, P., Haberl, H., Popp, A., Erb, K. H., Lauk, C., Harper, R., ... & Masera, O. (2013). How much land-based greenhouse gas mitigation can be achieved without compromising food security and environmental goals?. Global change biology, 19(8), 2285-2302. - Pimentel, D., McNair, M., Buck, L., Pimentel, M., & Kamil, J. (1997). The value of forests to world food security. Human ecology, 25(1), 91-120. - Nkem, J., Santoso, H., Murdiyarso, D., Brockhaus, M., & Kanninen, M. (2007). Using tropical forest ecosystem goods and services for planning climate change adaptation with implications for food security and poverty reduction. [, France]	Sunderland et al. was added
25635	72	37	72	37	New analyses show that there are trade-offs in using forest management to meet climate objectives. See in particular : - Luyssaert, S., Marie, G., Valade, A., Chen, Y. Y., Djomo, S. N., Ryder, J., ... & McGrath, M. J. (2018). Trade-offs in using European forests to meet climate objectives. Nature, 562(7726), 259. [, France]	Added
30953	72	22	73	9	It seems that in this case restoration is a different category than forest management. It could be clarified under Ecosystem-based adaptation, which could be called restoration, since it is described at such in 6.5.1.14 [Kelsey Perlman, France]	The aggregation of forest option has been slightly change to keep consistency with other chapters
14319	72	14			Again, there is a perplexing contradiction here, acknowledging that agroforestry takes land away from food production, but yet increases food security? While it is acknowledged that improved soil condition may be achieved after agroforestry (minor gains), this does not compensate for losses to food production through tie- up of land. These contradictions need to be reassessed with a more balanced perspective. Perhaps some examples of food- tree crops and relative changes to food production value could be included here. [Lukas Van Zwieten, Australia]	This is being looked into
18339	72	22			sustainable forest managment also has benefits for adaptation (therefore a positive arrow for adaptation in the table should probably be justified), for instance by choising more drought-tolerant species thus decreasing fire risk: Astrup et al., 2018 https://www.nature.com/articles/s41558-017-0043-3 [Edouard Davin, Switzerland]	This is now quantified and reflected in table 6.54
2925	73	6	73	9	Tenure security and regulatory issues are much more important that education or access to markets or credit as constraints on sustainable forest management, particularly for community forest management. A. Pagdee, Y Kim and P Daughterty 2006 Society and Natural Resources. D. Macqueen. 2013. Small Scale Forestry. [David Kaimowitz, Nicaragua]	Land tenure is now mentioned in our section and more extensively in chapter 7
39885	73	8	73	9	Following "... (Bustamante et al. 2016) ...", add "; however, it should be noted that most sustainable forest management programs do not manage specifically for carbon benefits." [, United States of America]	The sentence has been revised totally

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8013	73	10	73	10	The arrow at 'L' column in the figure should be 'moderate' judging from the text. [Hiroaki Kondo, Japan]	Corrected
8011	73	12	73	12	derviving --> deriving? [Hiroaki Kondo, Japan]	Done
10285	73	16	73	17	code in figure shows "large" not moderate [Jean-Luc Chotte, France]	Corrected
10287	73	20	73	20	reduces production of staple crops - could have negative impacts on food security at least in short term [Jean-Luc Chotte, France]	Corrected
10289	73	37	73	37	This is a very bold statement, though "important" is ambiguous. Ch4 actually says that it is the most widespread and studied process. Please clarify how you define important. [Jean-Luc Chotte, France]	most widespread soil degradation process.
8015	73	29	74	9	No comment on Saturation or reversibility issues in the text. [Hiroaki Kondo, Japan]	Done
8017	74	10	74	30	No comment on Saturation or reversibility issues and cost in the text. [Hiroaki Kondo, Japan]	accepted. See comment #8015
5731	74	22	74	23	check the validity of this sentence! [Sanaz Moghim, Iran]	corrected. Some few advers side effects
10291	74	24	74	24	Barriers include cost of high-water-use-efficiency irrigation systems [Jean-Luc Chotte, France]	accepted
8019	74	31	75	9	No comment on Saturation or reversibility issues in the text. [Hiroaki Kondo, Japan]	accepted. See comment #8015
8021	75	10	75	27	No comment on Saturation or reversibility issues in the text. [Hiroaki Kondo, Japan]	accepted. See comment #8015
10293	75	19	75	20	it is hard to see how the benefit of forest fire management is larger for food security than for mitigation?? [Jean-Luc Chotte, France]	Revised using more references and reanalysis
5733	75	30	75	31	why ''The prevention and management of landslides and natural hazards has limited impact on GHG emissions" since those hazards can affect canopy cover, topsoil and thus CO2 capture and storage! [Sanaz Moghim, Iran]	not accepted. Prevention keeps the ecosystem undisturbed and with no land cover changes.
10295	75	35	75	36	landslides are mentioned only once in ch 4 and are not even listed as a degradation process, let alone one of the most severe degradation processes. Landslides clearly have severe impact where they occur, but the impact is highly localised. [Jean-Luc Chotte, France]	landslides are mentioned as degradation processes by FAO.
8023	75	28	76	11	No comment on Saturation or reversibility issues in the text. [Hiroaki Kondo, Japan]	not understood. Saturation is an issue in soil carbon.
8025	76	32	76	32	There is a comment on reversibility in the text, but there is no symbol in the table. Biophysical barrier is commented in the text but no symbol in the table. No comment on Technical barrier in the text, but there is a symbol for Technical barrier. [Hiroaki Kondo, Japan]	Figure revised. Reversibility now dealt with in new table and in the text
27285	76	32	76	33	Table 6.5.1.15: A forest remaining a forest instead of being deforested has logically implications on land degradation and deforestation, it is the absence of negative impacts on land degradation and deforestation in the case of avoided deforestation (REDD+), the forest reference levels under the Lima Hub of UNFCCC could give an worldwide figure. Please reflect these correlations in the table. [, Germany]	These links are more evident in the text now
2927	76	34	76	35	There are also major mitigation benefits not related to carbon emissions, particularly in the tropics. [David Kaimowitz, Nicaragua]	This is now reflcted both in table 6.4 and in the mitigation section 6.4.1.1.2

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25637	76	36	76	37	Further material can be found in: - McElwee, P., Thi Nguyen, V. H., Nguyen, D. V., Tran, N. H., Le, H. V. T., Nghiem, T. P., & Thi Vu, H. D. (2016). Using REDD+ Policy to Facilitate Climate Adaptation at the Local Level: Synergies and Challenges in Vietnam. Forests, 8(1), 11. - Morita, K., & Matsumoto, K. I. (2017). REDD+ Financing to Enhance Climate Change Mitigation and Adaptation and Biodiversity Co-benefits: Lessons from the Global Environment Facility. AGRIVITA, Journal of Agricultural Science, 40(1), 118-130. - Long, A. (2013). REDD+, adaptation, and sustainable forest management: toward effective polycentric global forest governance. Tropical Conservation Science, 6(3), 384-408. - Locatelli, B. (2014). Les synergies entre l'atténuation et l'adaptation. - Kissinger, G. (2011). Linking forests and food production in the REDD+ context. - Visseren-Hamakers, I. J., McDermott, C., Vijge, M. J., & Cashore, B. (2012). Trade-offs, co-benefits and safeguards: current debates on the breadth of REDD+. Current Opinion in Environmental Sustainability, 4(6), 646-653. - Larson, A. M. (2011). Forest tenure reform in the age of climate change: Lessons for REDD+. Global Environmental Change, 21(2), 540-549. [, France]	McElwee and Long now added added
30001	76	36	76	37	It is said there are "no quantified global estimates", which is inciorrect. In Doelman et al, 2018 it is shown that global reduced deforestation policy has little effect on the average global food security, but could have strong local effects, most notably in Sub-Saharan Africa where the prevention deforestation (resulting in a cap on cropland expansion) affects food security negatively as population and food demand are projected to cointinue to rise substantially: Doelman, Jonathan C., et al. "Exploring SSP land-use dynamics using the IMAGE model: Regional and gridded scenarios of land-use change and land-based climate change mitigation." Global Environmental Change 48 (2018): 119-135. Another study that provides global estimates is Kreidenweis 2017. In this study it is shown that in a scenario that avoids deforestation food prices increase compared to the baseline. [, Netherlands]	This is now reflected in the text
33011	76	32	77	6	Reduced deforestation and forest degradation' should, by definition, include the same co-benefits to M,A,D,L as Afforestation and Reforestation. [Christopher Pereira, Canada]	This is now reflected in the table 6.54
13201	76	32	77	6	Reduced deforestation and forest degradation must, by definaition, contribute to redeuce land degradation (of whioch it is a part, and in drylands, where relevant, to desertification). It will aslo likley contribute to adaptation. In fact, if reforestatuon (section 6.5.1.18) cotnrubutes to MADL, then, loigically, so must reducing deforestation. [David Cooper, Canada]	This is now reflected in the table 6.54
13205	76	32	77	6	"barriers …. Include. Biophysical. " Really? These re more barriers to reforestation and afforestation than reduced deforestation. [David Cooper, Canada]	The sentence has been totally revised
5215	76	32	77	6	References to reversibility issues of "Reduced deforestation" seem not to be reflected in Table 6.19 or in the table in the subsection 6.5.1.15. [, Japan]	Refelected in the Appendix tables
13203	76	37	77	1	".. prone to both reversibility and saturation". Yes, to a point. But this is, logically, more of an issue for refrostation that these, and, in fact, to many of the other response options described in this chapter. It is illogical to stress them here. moreover, bith of these phenomenan are qualified. in reality some forest stocks are not really likly to suffer reversal, and some evidence shows that saturation is not reached in some ecosystems. [David Cooper, Canada]	"The carbon stock in the forest is prone to both reversibility and saturation" now deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
18341	76	36			There is evidence that deforestation is a cause of soil erosion globally (see Borrelli et al. 2017 : https://www.nature.com/articles/s41467-017-02142-7 and references therein) and therefore there should be a positive arrow in the table under "land degradation" and maybe also "desertification". [Edouard Davin, Switzerland]	This is now reflected in the table 6.54. Ref added
10297	77	1	77	2	the cost of avoiding deforestation is low compared with most other options. [Jean-Luc Chotte, France]	This is now reflect in the text
8027	77	24	77	25	"Barriers to implementation are mainly biophysical (since air pollution is transboundary, so sources are often far distant from the site of impact;…": I think this is not biophysical but institutional, because trans-boundary air-pollution should be solved through multi-national cooperation. [Hiroaki Kondo, Japan]	The sentence has been deleted
8029	77	31	77	31	The symbol of biophysical barrier may be necessary in the Table. [Hiroaki Kondo, Japan]	Added.
13207	77	31	78	9	It may be difficult to quantify, but it is misleadding not to indicate effects here. By defintiion, control of las addresses land degrdation. There are good examples of this and how IAS removal can contribute to A, D and L (eg workign for water programme in south africa). There are huge areas of Frica becomifg desertified becasue of invasive plsnts. [David Cooper, Canada]	Cross referenced to cross chapter box on afforestation
10299	78	1	78	9	this seems to ignore the issue of "woody thickening" of native species - eg shrub encroachment in Namibia and Australia. The debate on interpretation wrt land degradation, and the trade-offs between climate change , LD and food security should be discussed. [Jean-Luc Chotte, France]	Too specific to include here
5735	78	6	78	8	why the author means by Education can be a barrier! [Sanaz Moghim, Iran]	New barriers table
5737	78	12	78	18	decreases in surface albedo can reduce the net climate benefits! Needs to be clear! [Sanaz Moghim, Iran]	It is repeated multiple times in this chapter, and in Chapter 2
15693	78	13	78	14	Again you refer only to the surface albedo. [Tuomo Kalliokoski, Finland]	We refer to Chapter 2, where these aspects are discussed in detail
13209	78	14	78	16	same argument applies to 6.5.1.15 [David Cooper, Canada]	This has been revised
25639	78	20	78	21	We suggest that a better distinction be made between afforestation and reforestation, particularly with regard to food security issues. See GENERAL COMMENT ON AFFORESTATION AND REFORESTATION. [, France]	This is now implemented
8031	78	26	78	26	The symbol at L column in the table should be moderate according to the text. The symbol of the barrier for biophysical should be added. The symbol for technical barrier may be removed. [Hiroaki Kondo, Japan]	This has been revised
2883	78	32	78	32	I think 'storm surge' is only singular. [Luca Castrucci, United States of America]	Done
13211	78	35	78	37	same argument applies to 6.5.1.15 [David Cooper, Canada]	This has been revised
40813	78		78		6.5.1.19 : check coherency with SROCC on coastal wetlands (potential / blue carbon, costs, benefits / coastal adaptation). Seems one of the most expensive options here, check implications and solidity of finding. [Valerie Masson-Delmotte, France]	New cost values added in new table

Comment No	From Page	From Line	To Page	To Line	Comment	Response
913	78	10	82	29	All the 8 response options cited above are important from the point of view of achieving the Paris Agreement (PA) temperature target by capturing about 20 years' emissions from the atmosphere. The probability, therefore, of these options being pursued by countries across the globe is high. Many of these options are already embedded in the NDCs of countries committed under the PA. Problem is that 7 out of these 8 response options impact the food security negatively. With the expected focus on these options world-wide, there is high possibility that food deficiency would also occur in countries and regions dispersed across the globe. The SRCCL should highlight this aspect, and recommend for creation of an 'International Food Bank' to meet this kind of exigency. The proposed bank will monitor the impact of different response options on food security world-wide, and take actions to supplement food availability in affected areas. [Jagdish Kishwan, India]	This suggestion is policy prescriptive. Food security is deeply discussed in Chapter 5
8033	79	11	79	11	The symbol for technological barrier should be added in the table, and that for institutional should be halved. [Hiroaki Kondo, Japan]	Corrected
5217	79	11	79	35	References to technological barriers for "Biochar" seems not to be reflected in Table 6.19 or in the table in the subsection 6.5.1.20. [, Japan]	Now added
21299	79	13	79	38	The negative impacts of biochar application on soil and land degradation are not considered. I suggest considering https://doi.org/10.1111/gcbb.12037 https://doi.org/10.1016/j.envint.2015.10.018 https://doi.org/10.1111/gcbb.12007 [, United Kingdom (of Great Britain and Northern Ireland)]	Now added
25753	79	18	79	35	less land conflicts arise by considering comments 2, 4,6,7 and 8. [Roque Pedace, Argentina]	Reworded
10301	79	20	79	22	see comments above, on land area required and food security impacts [Jean-Luc Chotte, France]	Reworded
10303	79	23	79	23	what adverse side effect does this refer to? [Jean-Luc Chotte, France]	Specified
10305	79	24	79	26	This gives the impression that there is doubt that biochar is more stable than SOM that has not been pyrolysed, and that stability is variable for unknown reasons. Sohi certainly does not say that. Residence time is estimated at hundreds to thousands of years, and affected by feedstock, pyrolysis conditions (temperature and residence time in the kiln) and soil type (eg Singh,et al, 2012. Biochar carbon stability in a clayey soil as a function of feedstock and pyrolysis temperature. Environmental science & technology, 46(21), pp.11770-11778.; Wang, et al 2016. Biochar stability in soil: meta-analysis of decomposition and priming effects. Gcb Bioenergy, 8(3), pp.512-523.; Fang, et al 2015. Effect of temperature on biochar priming effects and its stability in soils. Soil Biology and Biochemistry, 80, pp.136-145.) [Jean-Luc Chotte, France]	Reworded and cross referenced to biochar sections elsewhere in the report
8035	79	32	79	32	production; (Woolf --> production; Woolf [Hiroaki Kondo, Japan]	Done
8037	79	33	79	33	properties; ref),: suitable reference should be inserted. [Hiroaki Kondo, Japan]	Done
10307	79	33	79	33	Singh,et al, 2012. Biochar carbon stability in a clayey soil as a function of feedstock and pyrolysis temperature. Environmental science & technology, 46(21), pp.11770-11778 [Jean-Luc Chotte, France]	Reference consulted
8039	79	36	79	39	In the text it is shown that the cost of restoration and avoided conversion of peatlands is potentially low-cost, however, the table shows this option is high-cost. [Hiroaki Kondo, Japan]	Corrected
13213	79	36	80	22	pestland restoration in uplands will contribute to adaption through downstream regulation of water supply and flood atenuation [David Cooper, Canada]	Reworded

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14321	79	11			Table 6.5.1.20 See earlier comment on food security impacts of biochar re page 63 line 4 and Table 6.16. This assessment on food security 1) relies on unrealistic assumptions, not backed up in the primary literature, about competition for land and (2) ignores impacts of biochar on soil fertility. There is no reasonable justification for the large negative association shown here. [Lukas Van Zwieten, Australia]	Corrected
7421	79	19			Typo: change from 'got' to 'for' [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Done
21301	80	3	80	4	It is more than a temporary increase in CH4 emissions - see https://doi.org/10.5194/bg-12-4361-2015 . Suggest deleting 'temporary'. [, United Kingdom (of Great Britain and Northern Ireland)]	Reworded
10309	80	25	80	27	p32 says that the climate change impact is negative at "higher latitudes" - this should be reflected in the figure with a double-ended arrow. [Jean-Luc Chotte, France]	We clearly refer to the major potential for afforestation in the tropics. In the north the net effect can still be positive, but more uncertain.
15695	80	26	80	27	Seasonal snow cover refers implicitly again to surface albedo. [Tuomo Kalliokoski, Finland]	Correct.
25641	80	31	80	33	This paragraph should better reflect that land-based mitigiation options can also generate cobenefits of sustainability, including food security. It's particularly true for degraded land and for mangroves See GENERAL COMMENT ON CDR AND SUSTAINABILITY. For degraded lands, see section 4.7.3 pages 4-40 to 4-41. See also other scientific references such as: - Smith, P., Haberl, H., Popp, A., Erb, K. H., Lauk, C., Harper, R., ... & Masera, O. (2013). How much land-based greenhouse gas mitigation can be achieved without compromising food security and environmental goals?. Global change biology, 19(8), 2285-2302. [, France]	Reference consulted and added
8041	80	33	80	33	2013)Afforestation --> 2013). Afforestation [Hiroaki Kondo, Japan]	Done
29999	80	37	80	39	This study assesses the difference in potential of afforestation between forest plantations and naturel forest growth and is also a relevant reference for the trade-off with food security: Doelman, J.C., Stehfest, E., van Vuuren, D.P., Tabeau, A., Hof, A.F., Braakhekke, M.C., Gernaat, D.E.H.J., van den Berg, M., van Zeist, W., Daioglou, V., van Meijl, H., Lucas, P. Estimating afforestation potentials and possible risks to food security. Global Change Biology, in review. [, Netherlands]	Reference added
29997	80	42	80	43	the sentence on reduced deforestation either is a typo or should belong in the section on reduced deforestation [, Netherlands]	Corrected.
13215	80	23	81	2	This para refrs several times to the large co-beneifts for M, A, D amd L. But this is context specific for A< D, L. Afforeststion on mnon forest lands and using non native (perhaspo invasive0 species may be counter adaptative, for resilience, water supply, fire regimes etc, and cosnequenclty, even for M in some cases. See Velland et al. It is absurd that co-benefits are attrubuted to Afforesteation (without qualificationO but not to reduced deforestaetion!. [David Cooper, Canada]	These case specific effects are discussed in this chapter where afforestation is originally presented, and discussed in more details in the specific Afforestation box
8043	81	2	81	2	commitment; (Idris Medugu --> commitment; Idris Medugu [Hiroaki Kondo, Japan]	Done
8045	81	3	81	3	Missing symbol for saturation in the Table. It is shown in the text that "there are likely to be few biophysical or technological barriers", but those symbols are shown in the table. [Hiroaki Kondo, Japan]	Added
13217	81	3	81	25	avoided conveersion can contribute to A. (China's Grain to green programme shows rationale for this through resttroation) [David Cooper, Canada]	Added

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30593	81	13	81	14	Conversion also happens for other reasons, one of them being that, in some places, policy support and lobbying for agriculture is much stronger than for pastoralism (e.g. in some countries of eastern Africa). This can have desastrous consequences, when economic interests favour conversion to cropland in areas with high rainfall variability, where pastoralism is a much better suited form of land use. It should be mentioned somewhere, that two thirds of land occupied by humans is unsuitable for cropping and that therefore attention must be paid to livestock keeping (which - by the way - is totally absent from the SDGs). [Albrecht Ehrensperger, Switzerland]	Nuance added
10311	81	15	81	15	presumably this should say food insecurity [Jean-Luc Chotte, France]	Corrected
5739	81	19	81	20	" Avoiding conversion is low cost" needs to be said relative to what it is low cost! [Sanaz Moghim, Iran]	Corrected
8047	81	23	81	23	Missing ")" for both of "e.g." in this line. [Hiroaki Kondo, Japan]	Done
1951	81	23	81	23	Check parentheses. [William Lahoz, Norway]	Done
8051	81	26	81	26	The symbol for institutional barrier should be halved. [Hiroaki Kondo, Japan]	Corrected
32559	81	28	82	10	Enhanced weathering on land could also have co-benefits for rivers and oceans, as discussed in Lawrence et al., 2018, NATURE COMMUNICATIONS, DOI: 10.1038/s41467-018-05938-3. This could be addressed here. [Helene Muri, Norway]	Added
27287	82	1	82	1	"likely to be small adverse-side effects globally": to follow this logic seems very hard. We suggest explaining how this conclusion was reached in a bit more in detail. [, Germany]	Better cross referenced to evidence tables in section 6.4
8049	82	4	82	4	"Land management options (Smith et al. 2016a).": Incomplete sentence. [Hiroaki Kondo, Japan]	Corrected
6219	82	4	82	8	Another barrier to implementation that is not mentioned is public perception on the application of ground minerals to agriculture (Wright et al. 2014, Nat. Clim. Change; Pidgeon and Spence, 2017, Biol. Lett.) [Weimu Xu, Ireland]	Added
8053	82	11	82	11	The direction of the arrows at D and L columns in the Table is upside down. [Hiroaki Kondo, Japan]	We have corrected this
15697	82	11	82	11	Why reversibility is not any issue? We can be 100% sure that something buried to the ground will never come back? [Tuomo Kalliokoski, Finland]	Fuss et al. (2018) note that BECCS "is one of the NET options that is less vulnerable to reversal". For this reason, we have listed low risks of reversability.
13219	82	11	82	12	The green are under L is a mistake (see text, aslo see figire in SPM) [David Cooper, Canada]	We have corrected this
5219	82	11	82	29	In the table of 6.5.1.25, the directions and colors of arrows which depict impacts of "Bioenergy and BECCS" on desertification and land degradation seems to be incorrect. [, Japan]	We have corrected this
39887	82	11	82	29	Bioenergy and BECCS table lists one crown for cost ("Low Cost"). BECCS is contingent on CCS, which is currently cost-prohibitive and technology-dependent. This should be listed, at a minimum, as high cost or variable cost, since some aspects of costs are TBD. It is even noted that "In terms of technological barriers, while there are a few small BECCS demonstration facilities, BECCS has not been implemented at scale (Kemper 2015)." This makes cost a large unknown. [, United States of America]	We have moved the cost information to a separate table and harmonized our definition of "low" across options. As a result, bioenergy and BECCS is no longer considered "low cost". We have also added some quantifications on BECCS cost, including the uncertainty, to be clearer.
30107	82	12	82	12	The table presented is not in line with the consecutive content of section 6.5.1.25 and not in line with the overview-table 6.19 on page 6-68. [, Netherlands]	We have corrected this
25643	82	13	82	14	The issues associated with the permanence of underground storage and the risk of reversal should be highlighted. [, France]	Fuss et al. (2018) note that BECCS "is one of the NET options that is less vulnerable to reversal". For this reason, we have listed low risks of reversability.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39889	82	13	82	14	Co-benefits were not discussed in the cited Section 6.4.1.1 at all. Not sure what all these estimates/confidence leves are based on. In that section there was very little biomass discussion and the table there lists large negative effects, so something is off here. Either way, this should be toned down, in that large co-benefits are possible, depending on the type of biomass, how it is grown and used, the degree of direct and indirect land use change related to its production and what energy source it replaces. These important elements should be discussed. [, United States of America]	This particular sentence has been removed due to edits suggested by other review comments. Additionally, we have gone through the text to ensure consistency and balance in the discussion of bioenergy and BECCS. For the tables with potentials, we did have to choose one option to assess. For consistency with other options, we are choosing the maximum potential for mitigation, which does have adverse side-effects. However, we have included this caveat in the table and in all of the text describing it.
8055	82	13	82	29	There is no comment on educational barrier, but the symbol is shown in the Table. [Hiroaki Kondo, Japan]	We have corrected this
10313	82	14	82	16	the figure shows benefits for Desertification and land degradation. Strategic integration of biomass production can provide benefits for management of LD, and can enhance sustainability of ag systems, and thus contribute to food security. It need not have adverse impacts if deployed carefully. [Jean-Luc Chotte, France]	We have corrected this figure to be consistent with the larger table. We have also clarified that the arrows are for large-scale deployment of bioenergy and included text in the table indicating that other uses of bioenergy could have different effects.
30595	82	14	82	29	Two things to be noted here: (1) limiting bioenergy production to marginal or abandoned lands will not happen, as it is economically unattractive. Commercial production of bioenergy will seek to maximise revenue and has to compete with - still - low fossile fuel prices. Fuelcrops planted in marginal areas are simply not competitive. The case of Jatropha is very enlightening. (2) When it comes to bioenergy the notion of multi-purpose or multi-functional solutions is key: to take again the example of Jatropha, it can make sense - in some areas - to bank on jatropha hedges around crop fields. Putting together the hedge function and the energy plant function, without major opportunity costs of land, could be a viable option. [Albrecht Ehrensperger, Switzerland]	Our chapter assesses the co-benefits and adverse side-effects of different response options. The issues you mention belong in Chapter 7
10315	82	18	82	19	yes, so why is this not reflected in the figure? [Jean-Luc Chotte, France]	We have corrected this
39891	82	18	82	20	Also prior land use; indirect LU impacts should also be included here. [, United States of America]	We have added this information
31783	82	20	82	22	Benefits for mitigation can also be achieved though sustainable forest management as a mean to maximize carbon stored in woody based feedstock. Sustainable management depends on site specific circumstances (e.g. short forest rotation in areas prone to natural disturbances like fires) [Piera Patrizio, Austria]	We have added a caveat that the effects depend on which other response options are included

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25661	83	5	83	6	We believe that this figure is relevant and justified, and we suggest to improve it by adding two columns for biodiversity and water to also assess the impacts of each option on them (for example, using three elements: -, 0, +). We also suggest the following considerations: • Increasing soil organic matter content or reducing losses of organic matter from soils will also largely contribute to adaptation of agriculture to climate change (e.g. reducing erosion, increasing water storage/content in soils...). The arrow "Adaptation" for "Increased soil organic matter" should be larger. • "Behavioural barriers" item should be added to "Improved cropland management". • Improved grazing land management seems to cover also natural ecosystems. "Natural systems" item should be added to the column "Sectors" • Bioenergy and BECCS should be presented as costly options (SR15). Three coins should be added in the column "Costs". • Sustainable forest management contribute to adapt forests to climate change and involve natural systems. A large positive arrow should added in the cell "Adaptation", and the "natural systems" item should be added in the column "Sectors. • Biochar has a high mitigation potential locally but as it requires a lot of biomass to be processed (and thus produced) this means that the global potential is to be reduced. The arrow show be less large. This will also be consistent with the following sections of the report: lines 25-30 page 1-33, Table ES 2.1 page 2-6, lines 31-42 page 4-86. See GENERAL COMMENT ON BIOCHAR. • We suggest to add, below biochar, a line about organic waste recycling (e.g. manure, composts) that is mentioned in chapter 2 and 4. Recycling of organic waste is able to improve soil fertility and soil organic matter and to generate strong cobenefits in mitigation, adaptation, land degradation and food security. Large positive arrows should be added to the columns of these challenges. • Concerning "crop insurance", further explanations should be provided on the costs, including the relevant stakeholders. With regard to insurance, could you confirm that the idea is if insurances are provided by private companies then this will cost less for States? See GENERAL COMMENT ON INSURANCES • Agricultural practices behind improved xxx or management of xxx should be detailed, for instance in the §B5.2. Why isn't it sustainable instead of improved? See GENERAL COMMENT ON DETAIL OF THE PRACTICES [, France]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table
8057	83	9	83	9	The symbols for biophysical and technical barriers are not shown in the Table, while these are reffered in the text. The symbol for institutional may be halved. [Hiroaki Kondo, Japan]	We have made this consistent
40149	83	12	83	13	I understand there are no studies showing how dieraty change contributes to adaptation, but perhaps you could add in brackets in the text an example of how that would happen, for instance, by reducing land demand for livestock (mostly land used for cultivating crops for animals) in a context in which land will be scarce, is an adaptation outcome of dietary cange [Marta Guadalupe Rivera-Ferre, Spain]	We have added this information

Comment No	From Page	From Line	To Page	To Line	Comment	Response
27289	83	9	84	9	We have the following questions on specific results of 6.5.2.1 Dietary change and 6.5.2.3 Reduce food waste and kindly ask the authors to check and revise/harmonize: 1) Although "dietary change" and "reduce food waste" are adaptations measures as indicated in Figure SPM.1 and the discussion in chapter 5.5.2. clearly shows the adaptation potential of these two measures, they feature no adaptation co-benefits in the resulting table. Please maybe use a footnote to clarify. 2) We do not understand, why a dietary change features a saturation or reversibility issue (while reduced food waste only a saturation issue). Please clarify or do not use these categories. [, Germany]	We have corrected this
5221	83	9	84	9	References to biophysical and technological barriers of "Dietary change" are not reflected in Table 6.20 and table in subsection 6.5.2.1. In addition, the size and colors of the arrows which depicts impacts of "Dietary change" on food security seems to be incorrect in the table in 6.5.2.1. [, Japan]	We have corrected this
3689	83	1			reconsider title: to give guidance to the reader better write: Managing Integrative Response option.... [Cordula Ott, Switzerland]	Title reworded
21585	83	7			Table 6.20: why does "improved food transport and distribution" not have a co-beneficial arrow for adaptation? Surely this can be an important factor to avoid losses, limit price spikes, increase accessibility etc? [Andy Reisinger, New Zealand]	Limited literature/evidence to substantiate direct co-benefit
40151	84	2	84	5	I would not fully agree with this statement. Clearly diets are cultural, but at the global level there has been a dietary change in the last 25 years (nutrition transition). Reasons for this change are diverse, including economic, demographic (migration to cities) but in any case it shows that changing diets is possible since we have already witnessed this change in only two generations. I would also add here economical factors. In some places eating healthy is more expensive than eating unhealty. [Marta Guadalupe Rivera-Ferre, Spain]	We have added a caveat noting that diets have changed significantly in the past
8059	84	10	84	10	The symbol for educational may be removed from the Table, because it is shown in the text that educational barrier is few. [Hiroaki Kondo, Japan]	We have made this consistent
5741	84	21	84	22	why "There are few biophysical barriers! [Sanaz Moghim, Iran]	Now added more detail in a feasibility table
40153	84	25	84	26	I understand there are no studies showing how reducing post harvest waste contributes to adaptation, but perhaps you could add in brackets in the text an example of how that would happen, for instance, by reducing land demand in a context in which land will be scarce, is an adaptation outcome of dietary cange [Marta Guadalupe Rivera-Ferre, Spain]	Thanks for the suggestion but we are required to support these types of statements with evidence from previous studies.
5743	84	29	84	32	how "Reductions in food waste" can lead "reductions in agricultural area"! The are other main reasons for agriculture expansion, such as improper managements [Sanaz Moghim, Iran]	Wording improved to address use of uncertainty language
7423	84	30	84	32	Highly theoretical, reduction of pollution depends on so many factors like market and farmer behaviour, give citationfor this [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	This specific statement has been removed due to other review comments, but we have added additional citations throughout the chapter.
8061	84	33	84	33	economic --> educational? There is no key word for economic in barriers. [Hiroaki Kondo, Japan]	Barrier table removed and replaced by feasibility tables
8063	84	36	84	36	This sentence refers the barriers of educational and technological, however, there is no symbol for them in the Table. [Hiroaki Kondo, Japan]	Now added more detail in a feasibility table

Comment No	From Page	From Line	To Page	To Line	Comment	Response
29421	84	19			Reducing post-harvest losses and food waste could have some negative effects on resilience. Some of these losses come from over-planting and over-ordering at each stage of supply chain. This is becasuse farmers, suppliers, retailers want to ensure that even if something goes wrong (e.g. for farmer - low yields due to bad weather) they will still be able to meet their custumer expectations. But if it is a good or normal year, and nothign goes wrong, there is a surplus, and that surplus often translates to waste or 'downgrading' such as feeding to livestock. If we try really hard to optimise the system and reduce any 'surpluses' we might be more exposed to shocks. Again, I don't know about a good reference for this. I would recomend saying: There are likely to be no adverse side-effects, however this area should be studied further. [Bojana Bajzelj, United Kingdom (of Great Britain and Northern Ireland)]	Wording improved to address use of uncertainty language
10317	85	10	85	10	section 6.4.5.2 does not explain the benefit for food security [Jean-Luc Chotte, France]	Reference to section 6.4.5.2 removed
8065	85	25	85	25	Institutional --> institutional [Hiroaki Kondo, Japan]	Done
8067	86	7	86	10	The barriers except for institutional are not mentioned in the text, but some other barriers are shown in the Table. [Hiroaki Kondo, Japan]	Now added more detail in a feasibility table
8069	86	11	86	11	It is said in the text that "There are no studies allowing the impact of improving food transportation and distribution systems on adaptation globally (Section 6.4.2.2).", but large co-benefit arrow is shown at A column in the Table. [Hiroaki Kondo, Japan]	This has been updated
8071	86	11	86	11	It is written in the text that "the cost can be expensive", but only one coin is shown at cost column in the Table. [Hiroaki Kondo, Japan]	This has been updated FD. Cost has been replaced by economic feasibility
5223	86	11	86	28	According to subsection 6.5.2.6, there are no global estimates of impacts of "improved food transport and distribution" on adaptation. The table in this subsection seems to be inconsistent with this information. [, Japan]	This has been updated
40155	86	13	86	15	I understand there are no studies showing how improving transport and distribution contributes to adaptation, but perhaps you could add in brackets in the text an example of how that would happen, for instance, improving storage capacity at farm level in a climate change context is also important if distribution infrastructures are predicted to fail. Same for higher levels for their impact on food reserves (with consequent impacts on food prices, food access) (see Rivera-Ferre 2014, Impacts of Climate Change on Food Availability: Distribution and Exchange of Food. In handbook of global environmental pollution. Springer [Marta Guadalupe Rivera-Ferre, Spain]	Thanks for the suggestion but we are required to support these types of statements with evidence from previous studies.
8073	86	29	86	29	It is said in the text that "There are likely to be few biophysical, technological or cultural / behavioural barriers", but those symbols are shown in the Table. [Hiroaki Kondo, Japan]	Barrier table removed and replaced by feasibility tables
40157	86	31	86	36	Same comment than previous. Worthy to add examples of how urban food systems would contribute to M,AD, L? [Marta Guadalupe Rivera-Ferre, Spain]	Barrier table removed and replaced by feasibility tables
25645	87	3	87	7	This statement should be re-verified in view of the potential of zero deforestation commitments. See GENERAL COMMENT ON SUPPLY CHAIN SUSTAINABILITY MANAGEMENT. [, France]	Considered but a decision was taken to retain estimate of moderate co-benefit.
8075	87	17	87	17	"(adoption": Missing ")" . [Hiroaki Kondo, Japan]	Done
8079	87	21	87	21	Missing symbol for cultural barrier in the Table. [Hiroaki Kondo, Japan]	Barrier table removed and replaced by feasibility tables
30199	87	28	87	29	2.5 people should be 2.5 billion people? [, Netherlands]	Corrected
8077	87	29	87	29	2.5 --> 2.5 million? [Hiroaki Kondo, Japan]	Corrected
10319	87	31	87	31	but the capital costs can be prohibitive [Jean-Luc Chotte, France]	Agreed - cost is sensitive to many implementation related factors.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10321	87	36	87	36	how is this a barrier to adoption of energy efficiency measures? [Jean-Luc Chotte, France]	Barrier table removed and replaced by feasibility tables
8081	88	1	88	7	There is no comment on barriers, but some symbols for barriers are shown in the Table. [Hiroaki Kondo, Japan]	Barrier table removed and replaced by feasibility tables
15699	88	3	88	4	There is only this one study giving global mitigation potential of material substitution? [Tuomo Kalliokoski, Finland]	We have expanded this quantification to include more studies.
2929	88	3	88	10	The text provides no evidence that the climate mitigation effects of secure collective land tenure are only moderate or that the land degradation co-benefits are small. Given the large amounts of carbon in collectively-managed forests that lack secure tenure rights, the risks of increased carbon emissions there, other non carbon emission climate mitigation benefits these forests provide it is questionable whether this conclusion of "moderate" is accurate (much less the diagram, which seems to indicate the benefits are small.) [David Kaimowitz, Nicaragua]	We have expanded this quantification to include more studies.
25647	88	4	88	6	The use of wood products in construction improves the insulation of the home, which is an adaptation outcome. [, France]	We have added more potential adaptation co-benefits to the text.
5745	88	4	88	7	any reference or reason! [Sanaz Moghim, Iran]	We have added more information on material substitution, including references.
25663	88	12	88	13	We believe that this figure is relevant and justified, and we suggest to improve it by adding two columns for biodiversity and water to also assess the impacts of each option on them (for example, using three elements: -, 0, +). We also suggest the following considerations: • Increasing soil organic matter content or reducing losses of organic matter from soils will also largely contribute to adaptation of agriculture to climate change (e.g. reducing erosion, increasing water storage/content in soils...). The arrow “Adaptation” for “Increased soil organic matter” should be larger. • “Behavioural barriers” item should be added to “Improved cropland management”. • Improved grazing land management seems to cover also natural ecosystems. “Natural systems” item should be added to the column “Sectors” • Bioenergy and BECCS should be presented as costly options (SR15). Three coins should be added in the column “Costs”. • Sustainable forest management contribute to adapt forests to climate change and involve natural systems. A large positive arrow should added in the cell “Adaptation”, and the “natural systems” item should be added in the column “Sectors. • Biochar has a high mitigation potential locally but as it requires a lot of biomass to be processed (and thus produced) this means that the global potential is to be reduced. The arrow show be less large. This will also be consistent with the following sections of the report: lines 25-30 page 1-33, Table ES 2.1 page 2-6, lines 31-42 page 4-86. See GENERAL COMMENT ON BIOCHAR. • We suggest to add, below biochar, a line about organic waste recycling (e.g. manure, composts) that is mentioned in chapter 2 and 4. Recycling of organic waste is able to improve soil fertility and soil organic matter and to generate strong cobenefits in mitigation, adaptation, land degradation and food security. Large positive arrows should be added to the columns of these challenges. • Concerning “crop insurance”, further explanations should be provided on the costs, including the relevant stakeholders. With regard to insurance, could you confirm that the idea is if insurances are provided by private companies then this will cost less for States? See GENERAL COMMENT ON INSURANCES • Agricultural practices behind improved xxx or management of xxx should be detailed, for instance in the §B5.2. Why isn't it sustainable instead of improved? See GENERAL COMMENT ON DETAIL OF THE PRACTICES [, France]	Table redesigned and broken into two - a potentials and relative costs table and a feasibility table

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3691	88	8			reconsider title: to give guidance to the reader better write: Managing Integrative Response option.... [Cordula Ott, Switzerland]	Considered but decided to retain current title
21587	88	14			Table 6.21: why does "early warning systemsfor disaster risk reduction" not have a large co-benefit for mitigation? Reduced disaster risk means reduced food loss on-farm (e.g. crops destroyed before harvest, or at least allowing premature harvest for alternative uses; avoided animal deaths during droughts and floods meaning reduce production losses and wasted emissions). [Andy Reisinger, New Zealand]	We were unable to quantify mitigation cobenefits because literature is imprecise; presumably there is an impact but no one has measured it!
8083	89	1	89	1	The symbol at M column in the Table is not for moderate but small. [Hiroaki Kondo, Japan]	Arrows have been removed in revised table
15203	89	3	89	8	Since land tenure securityleads to reduced deforestation and degradation, its impact on mitigation should be large. [Daniel Zarin, United States of America]	We have removed land grabbing as a response option, material on land grabs is now in ch 7.4.4. Ch 7 does not however assess mitigation potential.
915	89	19	89	36	It is much more serious problem than being reflected in the SRCCL. Examples can be cited of MNCs and foreign governments purchasing large areas of land in Africa and South America. They use all kinds of chemicals- fertilisers and pesticides to get maximum returns from land, least caring for the environment, emissions and health of the local communities. Besides the social tension, such land grabbing creates, it also has the potential to lead to widespread social strife and unrest. This should be flagged more cogently in the SRCCL. [Jagdish Kishwan, India]	We have added more material on land grabs; now combined in ch 7.4.4.
15205	89	21	89	22	In the Brazilian Amazon, the relationship between land-grabbing and deforestation is well-established, hence it is surprosing to see its prevention as having only a small benefit for mitigation [Daniel Zarin, United States of America]	We have removed land grabbing as a response option, material on land grabs is now in ch 7.4.4. Ch 7 does not however assess mitigation potential.
5747	89	21	89	22	isn't it a large co-benefits? if "Preventing land grabbing" is" due to avoiding conversion of forests to agriculture and for biofuels" [Sanaz Moghim, Iran]	We have removed land grabbing as a response option, material on land grabs is now in ch 7.4.4. Ch 7 does not however assess mitigation potential.
8085	89	24	89	24	(Section 6.4.1.3;(D'Odorico --> (Section 6.4.1.3; D'Odorico [Hiroaki Kondo, Japan]	Done
1953	89	32	89	32	affected. [William Lahoz, Norway]	OK
8087	89	33	89	33	(Adnan 2013; --> Adnan 2013; [Hiroaki Kondo, Japan]	Done
8089	89	34	89	36	The relationship those barriers written in the text and symbols in the Table is unclear. [Hiroaki Kondo, Japan]	New table on feasibility has clarified these texts
8091	90	1	90	1	Why are all the symbols shown in the Table, though all those are not always referred in the text? [Hiroaki Kondo, Japan]	New table on feasibility has clarified these texts
917	90	1	90	17	With continued migration of people from rural to urban areas especially in developing countries, there is scope of institutionalising and upscaling the contribution of urban agglomerates in food security of a country. The practices of growing food horizontally and vertically in homes and public places need to be embedded in the planned development of a city still in the process of growth and attaining maturity, in other words a city in a developing country. Urban agglomerates still growing and expanding offer a very high untapped potential of adopting practices for contributing to regional and national food production. Adoption of such farming practices need encouragement through formulation of supportive policy and legal regimes, with incentives for higher performance. This needs to be flagged more prominently in the SRCCL. [Jagdish Kishwan, India]	This has been mentioned now in section on urban food systems
3463	90	7	90	8	The expression of "China alone has 20Mha of land degraded by urban sprawl" here lacks literature support. The conclusion, which is quoted from Section 6.4.4.3, is supported by no literature. So it is suggested to delete the conclusion. [, China]	Several papers in text are cited for this figure and conclusions, including Chen 2007 and Song and Deng 2015, and new ref of Bren d'Amour 2016

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32593	90	24	90	28	Here are some studies assessing the impact of livelihood diversification on desertification which this report can useful Landscapes of Diversity: A Local Political Ecology of Livelihood Diversification in South-Western Niger. Simon Batterbury. Cultural Geographies. Volume: 8 issue: 4, page(s): 437-464 The changing contexts of the desertification debate. S.M.Herrmann C.F.Hutchinson. Journal of Arid Environments, Volume 63, Issue 3, November 2005, Pages 538-555 Adaptations to climate change, drought and desertification: local insights to enhance policy in southern Africa. Lindsay C.Stringera Jen C.Dyer , Mark S.Reed, Andrew J.Dougill, Chasca Twyman, David Mkwambisi. Environmental Science & Policy. Volume 12, Issue 7, November 2009, Pages 748-765. Land Use Policy. Volume 30, Issue 1, January 2013, Pages 814-824 Landscape diversity in a rural territory: Emerging land use mosaics coupled to livelihood diversification. Mónica Ribeiro Palaciosa Elisabeth, Huber-Sannwalda Luis García Barrios, Francisco Peña de Paz, Jaime Carrera Hernández, Maria de Guadelupe, Galindo Mendoza. Land Use Policy Volume 30, Issue 1, January 2013, Pages 814-824 [Neeraja Havaligi, United States of America]	Thanks, these have been added
8093	90	31	90	33	There is no explanation of barriers for technological and cultural barriers which are shown in the Table. [Hiroaki Kondo, Japan]	New table on feasibility has clarified these texts
8095	91	1	91	1	Why are all the symbols shown in the Table, though all those are not always referred in the text? [Hiroaki Kondo, Japan]	New table on feasibility has clarified these texts
8097	91	21	91	21	Text indicated that cost of EWS is large, but the number of coin in the Table is one. Is this suitable? [Hiroaki Kondo, Japan]	New table on feasibility has clarified these texts
8099	92	27	92	30	Text indicated that cost of Commercial crop insurance is large, but the number of coin in the Table is one. Is this suitable? [Hiroaki Kondo, Japan]	New table on feasibility has clarified these texts
22849	92	31	94	7	Add impact of integrated response options on biodiversity and ecosystems and ecosystem services. RATIONALE: the concept of nature's contriutions to people is relatively recent. This section should be more inclusive. The way how SDGs and NCPs are addressed in this chapter will most certainly lead to confusion. Also this section does not replace the request chapter 6 p66-92. [Anastasios Kentarchos, Belgium]	Cross chapter box on Ecosystem services now is in ch 6 which should clarify why NCPs and ES are used in different contexts.
7425	92	11			Typo: 'mitigation' [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	Done
8101	93	13	93	13	Where is supplementary tables A4 - A9? [Hiroaki Kondo, Japan]	They weren't sent for review
10323	93	21	93	21	NCP terminology does not include "provisioning". [Jean-Luc Chotte, France]	Removed and replaced with 'supply'
40815	93		93		where to find integration in e.g. climate resilient development pathways of integrated response options ? [Valerie Masson-Delmotte, France]	Not in this chapter - probably Ch7
10325	94	4	94	4	It is unclear on what the impacts on NCPs are based. This needs a similar treatment as with the other sustainability dimensions where for each sources and quantities were mentioned. Here it is unknown on what the gradings are based and to what extent this reflects the underlying literature [Jean-Luc Chotte, France]	Sources provided in appendices
22851	94	4			It is unclear on what the impacts on NCPs are based. This needs a similar treatment as with the other sustainability dimensions where for each sources and quantities were mentioned. Here it is unknown on what the gradings are based and to what extent this reflects the underlying literature [Anastasios Kentarchos, Belgium]	Sources provided in appendices

Comment No	From Page	From Line	To Page	To Line	Comment	Response
15207	96		97		color-coding of cells in the tables is not explained, and it's unclear if it's accurate. Please check all cells. For example, what is the relationship between dietyar change and affordable and clean energy? [Daniel Zarin, United States of America]	Discussion of the relationships are in the appendix tables
40817	96		97		traceability of tables to source literature, confidence levels? [Valerie Masson-Delmotte, France]	Sources provided in appendices
3321	96		101		The tables contain useful information but are hard to read and probably too detailed for the message conveyed e.g. Table 6.28 is arguably not all that useful and could be more simply summarised to increase readability [Dave Reay, United Kingdom (of Great Britain and Northern Ireland)]	Size increased
39893	98	2	98	10	Figure 6.7 and its description are unclear. Recommend revising to streamline and better describe what is being shown. [, United States of America]	The figure has been revised and the text provides detailed explanations
21589	98	3	98	24	I am concerned that the definition of "appropriate" land management responses is too prescriptive and narrow. Just because a particular solution doesn't deliver large co-benefits across all land challenges doesn't make in INAPPROPRIATE. It just needs to be used more judiciously. This is a particular issue for the conclusion it reaches for BECCS; there is a large difference between saying that using BECCS on more than about 2-3% of the ice free area is inappropriate (a very strong term) and saying that BECCS doesn't deliver co-benefits so deploying it needs to be considered against the opportunity cost of how else the land could have been used (which is how I would tend to phrase this - especially since it links with the land-sharing/land-sparing discussion - how much land can be freed up for BECCS, and where does BECCS eat into essential land-uses? This figure does not answer that and so cannot be used to tell us what amount of land-use for BECCS is not appropriate). Also, how does the 'appropriate' land area derived in this way compare with the land-area used for bioenergy in SR15 scenarios - are SR15 scenarios with more bioenergy land-use inappropriate? I think considerably more work is needed to ensure the messages coming out of this discussion are robust and not simplistically (and perhaps unintentionally) prescriptive. The issue is critical and a lot of people will look for this information in this report, we have to make sure it stands up to scrutiny from multiple angles. [Andy Reisinger, New Zealand]	This language has been corrected and we now avoid the use of the word 'appropriate'. The text was also carefully revised to avoid seeming to be prescriptive.
5749	98	11	98	14	not clear! … for between 5 …! [Sanaz Moghim, Iran]	This has been edited
10327	98	13	98	13	Why is bioenergy considered relevant only in semi-natural forest? Provide method and supporting evidence. By definition, afforestation must occur on land that has not been forested in recent past, so it cannot be implemented in semi-natural forest. [Jean-Luc Chotte, France]	Definitions of afforestation and reforestation were revised. Bioenergy use of 'wild forests' would equate to deforestation and replantation, resulting in a semi-natural forest.
10329	98	19	98	24	How has this been determined? In fact, biomass production for bioenergy is mostly likely best-suited to degraded cropland, and strategic placement in agricultural landscapes to manage issues such as nutrient runoff. [Jean-Luc Chotte, France]	This has been revised and bionergy is now also addressed with croplands
10331	98	26	98	26	From the next sentence, it appears that you mean response options decline with an increase in number of challenges - ie an inverse relationship, the opposite of this statement. On what basis have you determined that this inverse relationship exists? In many instances the potential for benefits is greatest where there are multiple challenges. P 103 discusses the synergies from multiple options implemented simultaneously. [Jean-Luc Chotte, France]	The sentence has been revised for clarity. The text explains better that this is a statistically significant negative correlation across countries. Please note that the number of response options having only co-benefits for local challenges is low when there are a number of local challenges. However, this is not in contradiction with the fact that each of these response options may have a large potential for benefits under these conditions.
569	98	31	98	31	HDI is very interesting. Maybe develop this point here. [Nathalie Hilmi, France]	Noted and taken into account

Comment No	From Page	From Line	To Page	To Line	Comment	Response
27291	98	3			Figure 6.7 What does the long line at Bioenergy and BECCS mean? [, Germany]	This sentence has been corrected and the meaning clarified
7427	98	12			…"for between 5 (…) and one anthrome (…)", 5 what? And a numeral and spelled number should not mix in the same sentence [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	This has been edited
28689	98	25		31	Across anthromes and countries, the mean number of appropriate responses declines with the mean number of local land based challenges. Therefore human populations and their use of land have fundamentally altered global patterns of ecosystem form,process and biodiversity. Anthropogenic biomes provides a framework for integrating human system with the biosphere in the Anthropocene. I recommend Land use management system in relation to human population distribution in major anthromes, which are; (Dense settlement, Croplands, Rangelands, Forests and Indoor biomes) with Climate change mitigating strategy in relation to human population and the extensive use of the major anthromes in Anthropogenic biomes. [Abiodun Adegoke, Nigeria]	Thank you for offering this comment
10333	99	6	99	6	The mapping of the challenges by anthrome assumes that within each global anthrome the impact is homogeneous. There is much evidence that impacts are context dependent (beyond the anthrome as a context). Therefore, the maps run the risk of indicating locations with a certain accuracy that is not there. This is potentially misleading and not consistent with earlier remarks about context dependence. Either a more detailed mapping is done fully accounting of the literature evidence on context dependence or the maps are removed. [Jean-Luc Chotte, France]	This mapping provides an overall understanding of overlapping land based challenges. It is not presented by anthrome in Fig. 6.7. Please note that this figure is based on a previous section, see Fig. 6.2, that provides a spatial analysis of interlinked land challenges. It is clarified in the revised text that individual challenges may overlap and therefore that there may be more than one local challenge. The map does not include specific locations and it is strictly based on the overlay of maps extracted from literature and presented in Figs. 6.2B to 6.2H.
10335	99	6	99	6	A value judgement 'appropriate' is made without documenting what is 'appropriate' [Jean-Luc Chotte, France]	The language has been corrected and we now avoid the use of the word 'appropriate'. The text was also carefully revised to avoid seeming to create a value judgement.
22853	99	6	99	15	The mapping of the challenges by anthrome assumes that within each global anthrome the impact is homogeneous. There is much evidence that impacts are context dependent (beyond the anthrome as a context). Therefore, the maps run the risk of indicating locations with a certain accuracy that is not there. This is potentially misleading and not consistent with earlier remarks about context dependence. Either a more detailed mapping is done fully accounting of the literature evidence on context dependence or the maps are removed. [Anastasios Kentarchos, Belgium]	This is indicative and should not be interpreted too stricly there are other context dependent issues
22855	99	6	99	15	A value judgement 'appropriate' is made without documenting what is 'appropriate' [Anastasios Kentarchos, Belgium]	The language has been corrected and we now avoid the use of the word 'appropriate'. The text was also carefully revised to avoid seeming to create a value judgement.
40819	99		99		Fig 6.8 : source of information? What does "number of challenges" mean? Based on which literature? Difficult to understsand the figure. I am not fully convinced of approaches just counting studies (also in Table 6.28). Explain the methodologies, assumtions, limits. [Valerie Masson-Delmotte, France]	This figure is based on a previous section, see Fig. 6.2, that provides a spatial analysis of interlinked land challenges. It is clarified in the revised text that individual challenges may overlap and therefore that there may be more than one local challenge. The map does not include specific locations and it is strictly based on the overlay of maps extracted from literature and presented in Figs. 6.2B to 6.2H.
28687	99	6		15	The below highlighted which are ; (A) Number of land based challenges (B) Number of appropriate responses (C) Human development index must be integrated for imate adaptive response in weather patterns of the Anthropocene. I recommend Global ecosystem Units called "Biomes", analysis of (Tropical rainforests and tge grassland). [Abiodun Adegoke, Nigeria]	Thank you for the comment. Anthromes are used in the analysis since they combine biomes and their anthropogenic use (see Fig. 6.2 A)

Comment No	From Page	From Line	To Page	To Line	Comment	Response
27293	99	13			What does "appropriate land management responses" mean? This is a policy prescriptive expression. [, Germany]	The language has been corrected and we now avoid the use of the word 'appropriate'. The text was also carefully revised to avoid seeming to be prescriptive.
10337	99				Fig 6.8 The number of appropriate responses is shown as high to very high across most of Australia - but much of which is extensive rangelands or natural areas of very low rainfall and sparse vegetation, where only a few options, if any, could provide any benefits. Strangely, the agricultural region of south western Western Australia is shown as having fewer options than central Australia. The pattern for Brazil is similarly hard to understand. This assessment needs to be revisited and deleted if it does not produce plausible results. [Jean-Luc Chotte, France]	This figure has been revised and barren lands were separated from rangelands. Please note that a large part of land areas in Australia is classified as rangelands (see Fig. 6.2A from Ellis and Ramankutty, 2008) and that these rangelands are not classified as hot-spots for the interlinked land challenges assessed in Figs. 6.2 B to 6.2 H. This implies that rangelands response options can be used in the absence of local challenges that would impair their use.
22857	100	8	100	10	A very arbitrary and debatable choice is made to fully focus on the IAM models and exclude all other relevant literature. It can be strongly questioned if the IAMS can really address the interlinkages between the response optiosn as they are normally based on very strong sectoral approaches with weak linkages and the land change modules are in general underdeveloped and weak. Moreover, there is a well documented uncertainty in their land modules that makes interpretation very hard and basically does not justify any high agreement conclusion, see doi: 10.1111/gcb.13447 [Anastasios Kentarchos, Belgium]	We have expanded the section to include non-IAM studies and clarified this in the text.
10339	100	8	100	10	A very arbitrary and debatable choice is made to fully focus on the IAM models and exclude all other relevant literature. It can be strongly questioned if the IAMS can really address the interlinkages between the response optiosn as they are normally based on very strong sectoral approaches with weak linkages and the land change modules are in general underdeveloped and weak. Moreover, there is a well documented uncertainty in their land modules that makes interpretation very hard and basically does not justify any high agreement conclusion, see doi: 10.1111/gcb.13447 [Jean-Luc Chotte, France]	We have expanded the section to include non-IAM studies and clarified this in the text.
8103	100	10	100	10	(e.g., (Griscom --> (e.g., Griscom [Hiroaki Kondo, Japan]	Done
29225	100	4	104	30	Section 6.5.5.2 is very useful. I wonder if you could add more on the implications of what table 6.28 shows? [Jan Fuglestvedt, Norway]	We have added more information on implications
27295	100	5			"large literature" contrasts with the only seven references provided. Please check. [, Germany]	There are more than 85 articles assessed in this section and included in Table 6.28. We have added this information. We've also clarified that some response options/challenges have more literature than others.
3693	100	12			reconsider title: Apply response option in future scenarios (?) [Cordula Ott, Switzerland]	Considered but title was derived from IPCC outline - so original wording retained
23467	101	1	101	9	Table 6.28 underscores how sparce the evidence is for drawing conclusions in this chapter. [John Dixon, Australia]	Table 6.28 refers only to future scenarios - there is a wealth of evidence (68 pages!) of references for the chapter as a whole
10343	101	2	101	2	I think you are referring to the third column [Jean-Luc Chotte, France]	Yes, we have corrected this
10345	101	3	101	3	surely ticks or crosses would do - this seems rather juvenile. Furthermore, the computer and book symbols are hard to make out, so the text is confusing. [Jean-Luc Chotte, France]	We have chosen to use colors and counts to make this clearer.
7429	101	3	101	8	It is not visible in Table 6.28 graphics which are computers and which are books as described in Table 6.28 caption [Anita Shepherd, United Kingdom (of Great Britain and Northern Ireland)]	We have chosen to use colors and counts to make this clearer.
1955	101	8	101	9	I suggest an increase in the font of Table 6.28. To help the reader, the caption could indicate the colour of the “computers” and the “books”. [William Lahoz, Norway]	We have increased the font and removed the symbols
39895	101	16	101	16	Increased use of bioenergy "can" result in increased. Need to add "can" in the sentence. [, United States of America]	We have added this.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21591	101	16	101	22	This discussion strikes me as wrong and misleading. Increased use of bioenergy does not result in increased mitigation, in many cases it is simply seen as the cheaper mitigation option (i.e. it results in LESS mitigation of other sources). Also Figure 6.9 shows that the statement is factually incorrect: bioenergy use of 51-150 EJ/yr results in more climate change in 2100 than 0-50 EJ/yr. That may be an artefact of the scenario selection, but the text is simply not correct as it stands. I would recommend leaving the temperature panel out of Figure 6.9 as the key relationships you want to show here are between BECCS, cropland area and food prices - what happens with temperature depends on how much other sectors mitigate (i.e. whether BECCS is additional to mitigation in those sectors or substituting for mitigation in those sectors) - this is well beyond the scope of this report and you don't have the space and experts to enter into a robust enough discussion of this. [Andy Reisinger, New Zealand]	We have dropped the temperature panel and added "can" to the text on the effect of bioenergy on mitigation.
39897	101	17	101	17	This is contingent upon agriculture crops being the only biomass feedstock for BECCS; currently it is unclear what the feedstocks will be. It is also acknowledged earlier in the chapter that the overall effects and co-benefits will depend on the type of feedstock. [, United States of America]	We have added "can" to this sentence. We have also added feedstock to the list of factors that matter for assessing the effect of bioenergy on challenges.
29223	101	19	101	19	"on" is missing before "a number" [Jan Fuglestvedt, Norway]	Done
22859	101	1			indicate'number of IAM publications' as other studies are ignored intentionally [Anastasios Kentarchos, Belgium]	We have added this information. We have also expanded the assessment to include non-IAM studies
10341	101	1			indicate'number of IAM publications' as other studies are ignored intentionally [Jean-Luc Chotte, France]	We have added this information. We have also expanded the assessment to include non-IAM studies
8105	102	2	102	7	It is necessary to explain what means by boxes, whiskers and dots. [Hiroaki Kondo, Japan]	We have added this information
8107	102	7	102	7	figure --> figure. [Hiroaki Kondo, Japan]	We have corrected this
39899	102	8	102	18	Suggest adding that, in some instances, synergies exist between land-based mitigation options. For example, implementing forest carbon mitigation and bioenergy policies concurrently can create greater benefits, particularly in the near term, than when implemented in isolation. This finding is based on recent literature: Baker et al. (2019). Potential complementarity between forest carbon sequestration incentives and biomass energy expansion. Energy Policy. 126. 391-401. 10.1016/j.enpol.2018.10.009. https://www.sciencedirect.com/science/article/pii/S030142151830661X Another example is Favero et al. (Climatic Change, 2017), which focuses on interaction between BECCS and forest carbon policies. [, United States of America]	We have added this information
10349	102	8	104	18	This discussion on integration of response options should be expanded substantially - this should be the major focus of the chapter. It should discuss the best ways to achieve integration, with synergistic outcomes; the need for integrated landscape-scale approach ie integrating response options spatially, utilising baseline measurements of current land condition, land potential assessment, evaluation of likely outcomes from alternative response options; how to choose an efffective combination of options. The LDN conceptual framework (Cowie et al 2018; Orr et al 2018) includes such an approach. [Jean-Luc Chotte, France]	We have expanded this text, but we aren't doing new analysis
27297	102	1			Figure 6.9 raises some questions: - B: why is the temperature rise (median and range) in 2100 for 51-150 so EJ/yr large? - C: how much of this area is additional to crop land area for food? - Please use colours that are easier to distinguish. [, Germany]	We have removed the temperature panel as there were too many non-bioenergy factors driving that relationship. Additionally, we've added information on energy cropland area and changed the color scheme.
7187	103	14	103	14	Insert 'in' before 'increased' [Debra Roberts, South Africa]	We have corrected this

Comment No	From Page	From Line	To Page	To Line	Comment	Response
10347	103	19	103	25	this par presents evidence that contradicts previous par - so flag this with "however" at start of par. [Jean-Luc Chotte, France]	We have added "However".
22861	103	26	103	31	Table 6.29: replace column O with B (for biodiversity and ecosystem services) this would be coherent with the earlier requests. [Anastasios Kentarchos, Belgium]	We have changed this
29227	103	19	104	30	Would be useful if you add more explanation of why the studies often find that combinded mitigation is not equal to the sum of individual migation options. While this is not surprising, it would still be good to have the mechanisms better explained. [Jan Fuglestvedt, Norway]	We have added this information
27299	103	26	104	1	The header of table 6.29 states "Interlinkages and interactions between land-related response options", but you provide only an assessment of a combination of two response options on different targets. Please reorganize the table so that all options are compared with each other. The targets could then be given as blue and red symbols in each cell, for example. [, Germany]	Given the limited amount of literature, we have opted to focus on interlinkages with bioenergy & BECCS in the table and are using the text to discuss other combinations available. We have clarified this in the text and table.
27301	103	31	104	1	The direction and colour of the arrows are not clear. E.g. why has BECCS + reduc. deforestation/AF/RF a negative effect on mitigation? Please improve explanation of these tables. [, Germany]	We have added more information on this table in the text
21593	103	31			Table 6.29: I'm confused, I don't understand why reduced deforestation has a negative effect on climate change and on mitigation - do you mean a negative effect on temperature and on emissions (i.e. less temperature rise, less emissions)? Please clarify. But increase food productivity has a positive effect on mitigation (but I assume you mean this to say it reduces emissions, not that it increases emissions)? [Andy Reisinger, New Zealand]	We have clarified this in the text.
12271	103	31			The columns for desertification and land degradation cause difficulties for the reader as a positive interaction is undesirable ie increased land degradation. Could these be flipped for consistency? [Hans Poertner and WGII TSU, Germany]	We have switched to using colors instead of arrows to make this clearer
15209	103				I think the C,M arrows in the first row, and the M arrow in the second row are wrong. [Daniel Zarin, United States of America]	We have removed the arrows to make the table clearer and corrected any issues in the process
3323	104	19	104	30	Useful summary - is 'blue carbon' considered (beyond coastal wetland conversion)? Presumably some large (and highly uncertain) C seq potential through macro and micro algae (plus mangroves and sea grass beds) - seems like a clear 'gap' area in terms of research [Dave Reay, United Kingdom (of Great Britain and Northern Ireland)]	This report is focused on land, so we have limited ourselves to land-based response options
22863	104	22	104	27	THIS IS A KEY MESSAGE AND SHOULD BE LIFTED IN THE SPM [Anastasios Kentarchos, Belgium]	We've included this in the chapter executive summary and proposed it for inclusion in the SPM
40821	104		104		missing final section on knowledge gaps. [Valerie Masson-Delmotte, France]	Ths knowledge gaps are threaded trhoughout the chapter (indicated by no data and low confidence statements) and we have no room for a separate section here

Comment No	From Page	From Line	To Page	To Line	Comment	Response
30597	104	31	105	11	The chapter does a very good job in outlining the co-benefits and adverse side-effects of different response options, and the potential interactions with SDGs and NCPs. What is laking in my view is something to bring it all together at the end. For example what logical clusters of co-benefits and trade-offs emerge when synthesising the whole thing. Are their logical pathways that can be sketched based on this? Is it possible to translate the catalogue of co-benefits and adverse side-effects into logical alliances between various governance sectors, scales, or stakeholder groups? I didn't have time to go through chapter 7 and am not sure if some of this is taken up there. If not, I think it would make sense to add a section at the end of chapter 6, possibly at the expense of other parts of the chapter, which could be shortened. On page 4, line 46 there is a remark that "enough is known" to take action (which is true). But the chapter tends to prove that still a lot is unknown about how to design such cross-sectorial governance alliances. It just seems like conventional governance tools and mechanisms are not suitable to deal with complex interactions between competing development goals. Knowledge is needed at that level. [Albrecht Ehrensperger, Switzerland]	New section on stakeholders has been added to end of chapter, as well as more grouping of most feasible options
23469	104	31	105	11	Following the framework and approach of this chapter, lacking specific spatial specifciity, the response options can only be linked wot a menu or checklist of policy improvements. [John Dixon, Australia]	Ch 7 has a table 7.x which outlines both response options and policies and their respective applications
3303	104	32	105	11	I likes this last section, very clear and acts as a good 'conclusion' for this chapter as well as leading onto the next chapter well. [Viola Heinrich, United Kingdom (of Great Britain and Northern Ireland)]	Thank you, this has been expanded as well
12273	105	16	105	24	FAQ 6.1: Although the information given in these lines may be important for the context, this is a very long introduction for a question that aims to address approaches to study the interactions between land and climate. Approaches are mentioned in the last third, and only very superfically. Suggest to rephrase either the question or the answer. One solution could be to move the last sentences to the beginning of the answer and adjust. [Hans Poertner and WGII TSU, Germany]	FAQ 1 moved - two new FAQS added for FD
40823	105		105		texts of FAQ look very abstract, no examples. Audience? FAQ1 needs to explain which models are referred to; methods, tools. Hard to get a key message from a very open FAQ. [Valerie Masson-Delmotte, France]	FAQ 1 moved - two new FAQS added for FD
27303	105	13	106	2	The first FAQ would better fit in chapter 1. We suggest including SLM to the second FAQ, as done in chapter 3 regarding desertification. [, Germany]	FAQ 1 moved - two new FAQS added for FD
3695	105	13	106	14	This FAQ are important, but at the same time (partially) present a summary. The Box this could also be highlighted/named as such (the same fro FAQ in other Chapters). [Cordula Ott, Switzerland]	FAQ 1 moved - two new FAQS added for FD
12275	105	45	106	2	FAQ 6.2: Can anything be said about the costs and benefits of the various options? [Hans Poertner and WGII TSU, Germany]	FAQ 1 moved - two new FAQS added for FD
6835	106	4	106	13	This paragraph is unclear. Which land-based measures to the climate change may also affect desertification, land degradation or food security? [Changke Wang, China]	accepted
12277	106	4	106	13	FAQ 6.3: There might be mismatches between the question and the answer as well as between the first and the second half of the text. The way the second half is phrased now, it might not become fully clear if there are benefits or disadvantages. Why are poor soils addressed if according to the first sentence some mitigation options increase organic matter? [Hans Poertner and WGII TSU, Germany]	FAQ 1 moved - two new FAQS added for FD
27305	106	4	106	14	This question is interesting but the answer should be revisited and extended to the important issue of land-based CDR options. [, Germany]	FAQ 1 moved - two new FAQS added for FD

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8109	106	16	106	16	It is written that "Supplementary tables A4 to A9 show …" at line 13, page 93, but here referred that "Separate excel sheets will be provided for tables A1-A6." Are these tables same or not? [Hiroaki Kondo, Japan]	Yes - the same
14325	124	15	124	16	Dinesh D, Frid-Nielsen S, Norman J, Mutamba M, Loboguerrero Rodriguez AM, and Campbell B. 2015. Is Climate-Smart Agriculture effective? A review of selected cases. CCAFS Working Paper no. 129. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at: www.ccafs.cgiar.org [Samba Sow, Senegal]	done
14327	130	44	130	45	Gilman, E., H. Van Lavieren, J. Ellison, V. Jungblut, L. Wilson, F. Areki, G. Brighouse, J. Bungitak, E. Dus, M. Henry, I. Sauni Jr., M. Kilman, E. Matthews, N. Teariki-Ruatu, S. Tukia, K. Yuknavage. 2006. Pacific Island Mangroves in a Changing Climate and Rising Sea. UNEP Regional Seas Reports and Studies No. 179. United Nations Environment Programme, Regional Seas Programme, Nairobi, KENYA. [Samba Sow, Senegal]	done
3697	138	32		47	Many references are incorrect/incomplete; for example those [Cordula Ott, Switzerland]	done
8743	143	38	164	38	Some references were listed twice. For instance, line 28-42 and 43-46, line 32-35 and 36-38. [Changxiao Li, China]	done
14329	156	10	156	11	Pye-Smith C. 2013. THE QUIET REVOLUTION: How Niger's farmers are re-greening the parklands of the Sahel. ICRAF Trees for Change no. 12. Nairobi: World Agroforestry Centre. [Samba Sow, Senegal]	done
14331	157	30	157	31	Reij, C., G. Tappan and M. Smale, 2009 : Agroenvironmental Transformation in the Sahel Another Kind of "Green Revolution". IFPRI Discussion Paper 00914 [Samba Sow, Senegal]	done
3671	161	3		6	correction: Schwilch, G., F. Bachmann, J. de Graaff. 2012. Applied Geography 34:86-98 [Cordula Ott, Switzerland]	done
3681					in many refernces troughout this chapter, a space is missing [Cordula Ott, Switzerland]	References reformatted
32875					the phrases "no regrets" and "low regrets" are used in the executive summary but nowhere else in the chapter. Include a sub-section in section 6.5 to explain what you mean. [Doreen Stabinsky, United States of America]	The wording has been clarified on these
21303					GENERAL COMMENT ON CHAPTER - the section describing each individual integrated response option is potentially useful, however - a) it is extremely long and in many areas purely descriptive and b) inconsistent in the extent to which it is a critical assessment. For example, 6.3.1.1 describes the potential benefits of increased soil organic mater conent but also lists risks and side effects. By contrast, other subsections are simply a long list of positives. In these cases, are there no trade-offs or challenges to be overcome (sometimes it is specified that there are no side-effects, but is this always the case)? Therefore, please a) consider shortening these sections and b) provide a more rounded critical approach.. [, United Kingdom (of Great Britain and Northern Ireland)]	All text edited and replaced by tables
21305					GENERAL COMMENT ON CHAPTER - there is a significant amount of overkap between this chapter and section 2.7.1. For example, in giving numbers on mitigation potential or in describing the mitigation options. Please consider how you could reduce the length of the report by avoiding duplication. For example, Chapter 6 could refer back to Chapter 2 more often, rather than covering much of the same ground [, United Kingdom (of Great Britain and Northern Ireland)]	Cross referencing improved and numbers harmonised

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39901					This chapter is an important part of the assessment; however, there is only occasional mention of its immediate predecessor, the IPCC 1.5°C Special Report. This chapter could be improved by placing discussion in context of the 1.5°C SR, and the tremendous challenge of bringing net CO2 emissions to zero globally. For example, increasing agricultural productivity might allow for growing more food on less land, enabling greater use of BECCS as a negative emissions technology. [, United States of America]	Better cross referenced to SR1.5 now added
39903					Structure of the chapter is hard to follow due to overlapping conceptual frameworks and lack of clear division in the topics discussed between sections. There also appears to be overlap with topics in Chapter 7 (especially Section 7.6). This is a complex set of topics that have been confusing and overwhelming to many stakeholders. A clearer structure would likely improve the potential impact of this chapter. [, United States of America]	There were no specifics given on how reorganization might happen. Some material on land tenure has been moved to ch 7 to eliminate overlap.
39905					Some key pieces and sections of literature seem missing from this chapter. Suggest reexamining the literature review to ensure that it is comprehensive. [, United States of America]	There are 68 pages of references - the literature consulted is comprehensive
39907					There are many instances in this chapter where the text does not accurately reflect the related technical literature. It reads more like a cursory review that glosses over many points, sometimes getting them wrong or presenting only one side of an evidence base (leaving the uneducated reader to assume there is no substantive debate). Three examples come immediately to mind: (1) the idea that more secure land tenure reduces deforestation (when in fact it can either increase or decrease land-use change depending upon governance/markets/context); (2) the idea that intensification of agriculture reduces agricultural expansion; and (3) the idea that biochar has many benefits and few if any negative consequences. These and many other ideas presented in the text as assertions need to reflect much more accurately the status of the science. [, United States of America]	These nuances have now been added
39909					A central theme in this chapter is "degraded land," but that term has not been adequately defined and it has many different meanings to different people/audiences. The chapter should both explain how this term has been used in different ways in the literature and what those different meanings mean for the associated analyses (and the type of analysis presented in this report), then identify clearly what definition this chapter will use, stick to it ,and remind the reader of it and how the findings would be different if other definitions were used, throughout the chapter. [, United States of America]	This has been done in Chapter 4 and the glossary
39911					There needs to be greater clarity and discipline distinguishing between trade-offs in land uses on the one hand and questions of best practices for a given land use for a given strategy on the other. These two categories are quite distinct but in the report are often be muddied and conflated. This problem may extend to other parts of the report besides Chapter 6. [, United States of America]	The two are used distinctly and are not conflated in Chapter 6
39913					Afforestation and reforestation need to be clearly distinguished, including the fact that afforestation has many more negative potential tradeoffs including danger for biodiversity (e.g., if afforestation is practiced in African savannas), the threat of taking away farmland, etc.). [, United States of America]	See new tables in section 6.3 with descriptions, context and evidence base

Comment No	From Page	From Line	To Page	To Line	Comment	Response
12495					Executive summary gives a nice general, mostly qualitative overview but would be more punchy if key response options / findings could be detailed (specified, quantified and compared), also and especially with respect to capacities for adaptation and mitigation. This would also help the development of the SPM as a stand-alone document. Such specification of text would help although response options are presented in the SPM as figures and tables; it would help the description of those tables and figures. If quantitative specific statements are not possible for global scale they may still be possible for key regional examples (case studies). Providing semi-quantitative estimates or orders of magnitude would also help to understand better and e.g. differentiate between whether the projected contribution of response option to solutions at global or regional scale are by e.g. 5 or 95 %. [Hans Poertner and WGII TSU, Germany]	Uncertainty language has been revisted throughout - quantification added to the ES
22029					Would it be useful to perhaps explain and/or make reference to the legal value of 'sustainable development', especially page 5 lines 17-23? [Petra Minnerop, United Kingdom (of Great Britain and Northern Ireland)]	Ch 7 has extended discussion on sustainable development
1703					In this Chapter, I found that the less-attension on the social-nature in the context of land-use changes and the impact of the climate change. Competing natural resources usage that leads to dramatic land use changes can threaten the balance of a social-ecological system. When this is the case, communities are directly exposed to the negative consequences of those land use changes. With the climate change or the short term weather patterns effects such short term drought or flood or avalanche shift the communities friom their native lands. This effects on their social canopy, the social-bonds. The displacement of the communities into new land setting could lead the different connection between the new lands and people. If the lands are not suitable to be inhabited, the social conflict or unrest could emerge by leading other socio-economic issues. [Sisira Withanachchi, Germany]	These issues are discussed in chapters prior to 6. Our focus is on respone options, not impacts of climate chang.