Comment No	From Page	From Line	To Page	To Line	Comment	Response
40561	0		0		Please see my general remarks on the report and those on the SPM. I appreciate the developments of chapter 3 from the FOD. Chapter 3 is addressing all the elements identified during scoping. The narrative works well. [Valerie Masson-Delmotte, France]	Noted, thank you.
40563	0		0		The ES of the chapter could be improved to be more clear on what is observed, the challenges of attribution, and what is projected as a function of different scenarios / levels of warming. Uncertainies associated with numbers is needed. Regional specificies could be developed further to provide substance to the SPM. A question emerges after reading page 6 : if solutions exist, why are they not implemented? What are the barreers and enabling conditions? And if rehabilitation was implemented, what would future climate change mean with high end scenarios of emissions? with low end scenarios of emissions? Education may be also mentioned in ES. [Valerie Masson-Delmotte, France]	Accepted, clarfified. Discussion on enbaling conditions is expanded. Many polices that enable specific responses target removing barriers for SLM. So if policy is strengthening land tenure security, then the barrier is land tenure insecurity. We included more discussion on barriers as well.
40567	0		0		Each section needs to end with a summary paragraph expressing key findings and assessment of associated confidence, feeding the ES. [Valerie Masson-Delmotte, France]	Accepted, we included such summary in each section, and in numerous cases also to specific sub-sections.
40571	0		0		Provide more insights on the (ir)reversibility of desertification (there are many implicit aspects, eg. Page 17, line 26). Be more explicit. [Valerie Masson-Delmotte, France]	Noted, we identified irreversibility as a limit to adaptation.
40575	0		0		A clear assessment of carbon stored in biomass and soils in dryland areas and implications of desertification / rehabilitation would be needed somehwere in the chapter. [Valerie Masson-Delmotte, France]	Accepted, included in Sections 3.4, 3.7.1, 3.5.1.
40579	0		0		A cross chapter box on irrigation may be needed (e.g. ch 2, 3,4, 5, 6, 7) [Valerie Masson-Delmotte, France]	Accepted, done in Chapter 2.
40591	0		0		Having the risk ember on desertification in chapter 7 is strange. Call to chapter 7 here is needed. [Valerie Masson-Delmotte, France]	Accepted, we worked together with Chapter 7 on the risk ember for desertification. The risk ember on desertification is placed there for consistence with other risk embers and for avoiding duplications.
21665	0				Please cross-check all the numbers given in Tables 6.4ff in chapter 6, and reconcile with your chapter. If numbers are different, can they be rconciled? If Chapter 6 gives numbers that your chapter doesn't, why? Could you provide those numbers? Ideally, chapter 6 should be able to grab all numbers it needs for those tables from your chapter, not from the primary literature. [Andy Reisinger, New Zealand]	Accepted, done.
21669	0				Please do a word-search for "likely" in your chapter and ensure that any uses of the word that do not represent a formal, quantified uncertainty assessment are replaced with another appropriate expression. [Andy Reisinger, New Zealand]	Accepted, done.
41539	0				The aspects of desertification and factors that conduce to desertification and the effects of climate change in their [Cristobal Felix Diaz Morejon, Cuba]	Noted. Unfortunately, we could not understand this comment as it is not complete.
41541	0				In all text are used a quantity of references that have much time for this study, I suggest that maybe reinforced with [Cristobal Felix Diaz Morejon, Cuba]	Noted. Unfortunately, we could not understand this comment as it is not complete.
7309	0				The strong solutions focused narrative of this chapter is highly commended. But is there any reason that improved "climate services" are not specifically called out as a response option? There is a lot of emphasis on the need for improved access to knowledge in the chapter - so it seems strange that climate services are not specifically highlighted, especially when assessing the options for improving advisory services. [Debra Roberts, South Africa]	Accapted, included.
7321	0				The solutions focus of this chapter would be greatly enhanced if there was a greater focus on the financial mechanisms and incentives available to address desertification. [Debra Roberts, South Africa]	Accepted, discussion included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6357	0				The chapter as a whole provides lots of useful information, especially at the regional level - thank you to the authors for this. However, it lacks information about limits to adaptation (e.g. associated with migration, conflict, food security) [, Gambia]	Thanks for the suggestion. A discussion on limits to adaptation has been added as a new sub-section 3.7.4.
11791	0				This chapter reads well, overall has a good logical flow and provides a lot of very interesting and relevant content. Congratulations to the authors. [Hans Poertner and WGII TSU, Germany]	Noted, thank you.
11793	0				Very often, relevant processes are described or mentioned (which is good for understanding the processes), but then there are no details such as quantifications / time periods / locations affected etc. confidence language is not used throughout [Hans Poertner and WGII TSU, Germany]	Accepted, quantification included whenever available.
11795	0				All figures in this chapters need to be able to stand alone. If they are taken from another source, please ensure this source is duly referenced and copyright is cleared. Please also ensure the figures are legible and have high quality; many currently are difficult to read. Please also ensure that maps have a somewhat similar layout, and that if a small location is shown in a map, its position should be indicated on a map of the greater area so that the reader has some orientation. [Hans Poertner and WGII TSU, Germany]	Accepted, done.
7363	1	1	1	1	I think this part needs some information (data and maps) from World Atlas of Desertification 3rd edition "Cherlet, M., Hutchinson, C., Reynolds, J., Hill, J., Sommer, S., & von Maltitz, G. (2018). World atlas of desertification. Publication Office of the European Union: Luxembourg" [Erhan Akca, Turkey]	Accepted, relevant information added, for example. see Section 3.2.2. Cherlet et al (2018) were cited about 10 times across the chapter.
7311	1		7		Gender emerges as a key issue in terms of vulnerability and response options, but does not appear in the ES of the chapter. [Debra Roberts, South Africa]	Accepted, included.
7313	1		7		The chapter paints a complex picture of the relationship between poverty and desertification, but this more nuanced argumentation does not feature in the ES. Poverty is an important consideration and its treatment in the ES should be deepened. [Debra Roberts, South Africa]	Accepted, added new points to show that poverty is both a driver and outcome of desertification.
8955	1	1	160	18	General impression is "desertification is the problem of dry, arid, semiarid, hyperarid regions only". On the other hand, numerous countries (e.g. from Annex V) are suffer from frequent drought as a consequence of climate change on stage, but that is not elaborated in this Chapter (maybe other Chapters did this, but my opinion is that desertification should at least mention this). Point is: The problem of desertification is also indirectly related to the other countries, even in Europe which facing very frequent drought in the last 10 years. That conditionally affect migrations particularly in post conflict environment (e.g. Balkan region). [Jean-Luc Chotte, France]	Noted. Desertification and drought are two distinct issues, and should not be conflated. Droughts occur in humid areas as well. Desertification happens only in drylands. Drought is also different from aridity. We have also defined the Aridity in the Introduction. We cover desertification in Europe in various sections. In the cross-chapter box on drought, we do discuss drought , including in EU, and also the link between drought and desertification.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
17765	1	1	160	19	I think there is some regional imbalance of information and references in the document. Also, there are some very innovative methodologies of approaching to sensitivity of land to desertification built on few and comprehensive criteria and indicators. I would like to mention here the approach developed in morocco, from 2011 to 2013, and presented in the desertification COP in 2014 and was adopted lately by some other countries such as Israel in 2015. This approach worth mentioning is base on the specificities of each territory with its strengths, its constraints, its potentials and its fragilities, working in a context of homogeneous spaces, conceived in the form of "ecoregions". This helps to better take into account the concept of sustainable development in concordance with the fragilities of each space. The sensitivity was evaluated based only on three indicators encompassing human actions and biological characteristics of ecoregions. For more details about this innovative approach can be found in these two documents: 1) http://www.eauxetforets.gov.ma/admin/telechargement/fr/PANLCD_RAPPORT_GENERAL_mars2011.pdf ; and 2) http://extwprlegs1.fao.org/docs/pdf/mor147302.pdf Regarding case studies, it would be worth to mention the millennium ecosystem assessment for arid ecosystems, performed in three pilot sites in Morocco, Egypt and Saudi Arabia. More details on this study can be found in the two references: 1) https://www.youscribe.com/catalogue/documents/savoirs/science-de-la-nature/evaluation-de-l-ecosysteme-oasien-de-tafilalet-2114141 ; and 2) http://cedarekmp.net/arabma/docs/MA_final%20full%20Report_Low.pdf It will be worth also to mention in the document the 3S Initiative which was endorsed at the 1st African Action Summit held in the margins of the Climate Change Conference in Morocco on Wednesday, 16 November. This initiative has for objective to promote stability and security in the face of migration caused by environmental degradation and climate change. More details can found in : https://www.unccd.int/news-events/african-governments-launch-triple-s-3s-initiative-promote-stability-and-security-face There are also some processes of monitoring and evaluating desertification implemented in Tunisia and Morocco by OSS, and are worth to mention. More details can be found in : http://www.oss-online.org/cd_envi/doc/01/08.pdf ICARDA has also done a Review of Available Knowledge on Land Degradation on in Morocco OASIS — Combati ng Dryland Degradation. More details can be found in : https://apps.icarda.org/wsInternet/wsInternet.asmx/DownloadFileToLocal?filePath=Working_Paper_Series/OASIS/OASIS_2_Morocco.pdf&fileName=OASIS_2_Morocco.pdf [Abdellatif	Accepted, thank you for this comment. The issue of the regional imbalance has been addressed more systematically. Case study on oases in hyper-arid areas specifically incudes examples from Morocco. More studies related to Morocco were assessed. Thank you for the papers.
1299	1		160		Nicely written and description about Fig. 3.11 is now clear. So no more ammendments are required. [Pushp Raj Tiwari, United Kingdom (of Great Britain and Northern Ireland)]	Noted, thank you.
26633	1	1			An excellent chapter, well done [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Noted, thank you.
21691	1	1			Lack of economic assessment in the form of costs of desertification or the benefit from reduing or adapting to desertification as well as the cost of investment to deal with the problem at regional or global level. This needs to be reflected in the knowledge gaps. [Mustafa Babiker, Saudi Arabia]	Accepted, we discussed about costs and benefits of desertification whenever such figures were available in the literature. We also pointed out the lack of these in the knowledge gaps.
21759	3	1	3	34	Inconsistency in use of confidence levels. Some statements have them and some do not. [Graham von Maltitz, South Africa]	Accepted, we included confidence language for each statement whenever relevant. Some are supporting sentenes to the main statement that has a confidence language attached to it.
8139	3	5	3	9	is the desertification believed to occur in the area of Northeastern Brazil, Southern Argentina, Southwest USA? By definition, dessertification (Page 8) only occurs in arid, semi arid and dry semi-humid areas, and outside these area is categorized as land degradation. [Haruni Krisnawati, Indonesia]	Noted, the areas listed include arid, semi aid and dry sub-humid areas, therefore desertification can occur in them. No inconsistency with the definition.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21753	3	10	3	11	Although I like the idea of specific manifestations of desertification being discusses independently, in this key point the use of "biomass productivity - based desertification hotspots is difficult to understand without contexts. Possible rewording - "degradation hotspots as identified by a decline in biological productivity currently cover about 10% of drylands ...." [Graham von Maltitz, South Africa]	Acepted, included.
32979	4	1	4	15	Is it possible to include case studies of increase of erosion in wet tropical areas? [Jose Joao Souza, Brazil]	Rejected, wet tropical areas are outside the scope of this chapter. Chapter 4, however, has a case study on coastal soil erosion.
24823	4	3	4	5	In the table of contents, these should be indented rightward because they are at level five [Justice Issah Musah Surugu, Germany]	Noted, all the formatting issues have been carefully checked and changes have been included accordingly.
24821	4	13	4	16	In the table of contents there is a mistake in the numbering: 3.8.4.3 is followed by 3.8.3.4 [Justice Issah Musah Surugu, Germany]	Noted, all the formatting issues have been carefully checked and changes have been included accordingly.
31909	4	1	85	32	Throughout there is confusion between "climate" as an independent agent and as a contributor to desertification . For example page 5, line 40 and 44 , "…Desertification processes, coupled with climate change, are expected...." is confusing since a contribution of climate to desertification has been stated. Put symbolically, this means (climate x human factors) x climate. "Climate" has two roles, its potential contribution to desertification and subsequent interaction with desertification. [Stephen Prince, United States of America]	Noted. That is correct. Climate has two roles here. Both as a driver of desertification processes and as an independent (from desertification) driver of change in the named systems. We would re-write your formula such as: (climate x human factors) x climate change, which fits our discussion more accurately.
31911	4	1	85	32	The term "desertification" is mostly used without any indication of what sort. Page 14 lines 36-44 indicates some of the types but several of these have minimal feedbacks on or causation by climate. It seems that it is loss of vegetation cover that is mostly meant by "desertification" throughout the Report when climate is the subject. I suggest this (or whatever is intended) is/are made very clear when the term is used (see, for example Sect. 3.8.1.1. where erosion is specified, and broken down into different types). Because it naturally appears many times, maybe add a generic statement at the beginning on the meaning adopted when not qualified. Wherever something else is meant, it could be noted (e.g. "desertification - all types", desertification erosion", desertification loss of soil cover" etc.). Section 3.5.2. especially needs the types to be differentiated. [Stephen Prince, United States of America]	Accepted, throughout the chapter we now tried to mention the specific form of desertification when relevant.
31913	4	1	85	32	There are some inconsistencies between English and American spellings. [Stephen Prince, United States of America]	Noted, all the spelling issues have been carefully checked.
32001	4	1	85	32	I can find no reference to the need for baselines for trends. Without a baseline, a trend is meaningless. See IPBES LDRA Chapter 4, section 4.1.4. [Stephen Prince, United States of America]	Noted, text has been added to section 3.3.1 "The need to establish a baseline when assessing change has been extensively discussed in Prince et al. (2018). Desertification is a process not a state of the system, hence an “absolute” baseline is not required, however every study uses a baseline defined by the start of their period of interest."
32105	4	1	85	32	There is a great quantity of material in this chapter that is only indirectly relevant to desertification and climate. The result is 85 pages! A much more focussed and succinct text would greatly increase its relevance. [Stephen Prince, United States of America]	Rejected, the material presented in the chapter is required by the scoping process, and all of them focus on important aspects related to desertification under changing climate, hence important to be covered.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32117	4	1	85	32	Throughout the Report statements about the amount of desertification are cited, but without consistent indication of the methods used nor their validity. Broad statements are not adequate. For example, a study in XXX "...using NDVI...", does not indicate whether there was any normalization for rainfall, what was the resolution of the data, or details of the time-series (if indeed more than one data set was used) or if any field comparisons were made. (Page 23 lines 8, 24, line 1 are examples of a statement of method, but even these could usefully be added to.) This a critical issue - without these details, the validity of a figure cannot be known and it would be better to omit it. While adding these details will lengthen the text, a great deal of text could be saved if parts of the report not directly concerned with climate (e.g. Sect 3.5) were abbreviated or omitted. Also, there should be a generic statement in the introduction in lines 15 - 20 stating this important proviso. Something like, "Partly owing to the difficulties in detection of desertification and lack of agreement on the legitimacy of many methods used (see earlier Sections), it is hard to assess the validity of many of the studies reviewed here. Furthermore, few studies use the same techniques and so it is hard to make valid comparisons, and even more difficult to combine the results of different studies and areas to create an overview. " However, since adding these details would exclude a large number of studies, a brief statement, such as "...(methods not reviewed)..." or "...methods are subject to criticism..." or "widely-accepted...", should follow each result. [Stephen Prince, United States of America]	Noted. Thank you for this detailed feedback, we highly appreciate this. Section 3.5 on socio-economic impacts of desertification under changing climate is an essential part of the chapter as mandated by the scoping. Our discussion is not only of climate change, but of desertifiction under changing climate. As you rightly point out, the studies of the extent of desertification have diverse methodologies, we evaluated their methodologies, but presenting them here in detail will not only lengthen the text, but significantly dimish the appeal of this report to the audiences not specialized in those methods. We highlihgted in numerous places the difficulty of detecting desertification.
32147	4	1	85	32	A very large number of the topics that are included have no direct climate-related relevance. Notwithstanding, these examples are an impressive inventory and would be very suitable for a separate publication. [Stephen Prince, United States of America]	Rejected, all these elements discussed were mandated by the scoping, and they do have important and close links to the topic we discuss.
32165	4	1	85	32	This chapter has considerable variations of grammatical styles. A thorough edit is needed. [Stephen Prince, United States of America]	Noted, all the grammar-related issues have been carefully checked.
32177	4	1	85	32	Surely this chapter should follow Ch 4 Land Degradation? Especially as this chapter (3) defines desertification as land degradation in drylands - that is a special case of degradation. [Stephen Prince, United States of America]	Rejected, the sequence of chapters has been set in this order by the scoping document.
32179	4	1	85	32	There is no discussion of Zero Net Increase and its variants. This is the new foundation of much of UNCCD and other agencies. It has a large literature. However, it is not entirely satisfactory (e.g. in the case of biodiversity, in which it is rarely possible to replace a degraded piece of land with a substitute) [Stephen Prince, United States of America]	Noted. The reviewer seems to be hinting at Land Degradation Neutrality. (LDN) This is discussed in Chpater 4 since it is relevant for all areas, not only drylands. In Chapter 3, we do highlight that LDN can serve as a overarching framework for technological, socio-economic and policy responses.
483	5	35	3	36	It is not correct to write that dust deposition have a cooling effect. I would suggest "the presence of dust over the ocean have a direct effect of cooling". [Beatrice Marticorena, France]	Accepted, text changed to "Atmospheric dust over the ocean was found to have a direct effect of cooling the ocean,..."
7015	5	4	4	4	This definition seems to suggest that desertification = land degradation. Since there are other forms of land degradation besides desertification, consider 'desertification is a form of land degradation…' [Debra Roberts, South Africa]	Rejected, indicating that "desertification is a form of land degradation...." would imply that there may be other forms of land degradation in drylands which are not desertification. All forms of land degradation in drylands are called desertification.
4131	5	2	5	2	It´s not correct -or redundant- to use "number" of extreme climatic events, especially if in the same sentence the concept "frequency" is employed. I suggest deleting “number”, but keeping “frequency”. [Eugenia Gayo, Chile]	Accepted, edited.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7019	5	2	5	9	Is there a global estimate of the increasing desertification? That will be a policy relevant message to communicate. It might also be useful to consider adding the region(s) experiencing the most severe increase. [Debra Roberts, South Africa]	Noted. There is no direct evidence from global model projections indicating increasing desertification under climate change. However, there is a following specific section for this subject: "3.6.1. Future Projections of Desertification." In this section we have assessed some important related aspects, including "increase in potential evapotranspiration (PET) worldwide as a consequence of increasing surface temperatures and surface water vapour deficit", and "associated changes in aridity indices that depend on this variable", the role of CO2 fertilization effect, impacts on dust storm activity. We have also provided information on the vegetation-based hotspots of desertification.
30441	5	2	5	24	As in previous IPCC reports, material on historical impacts precedes material on future projections. This provides a more accurate summary of the scientific findings, since historical impacts are based on actual measurements while future projections come from modeling with higher uncertainties. Therefore, re-order the text so that the paragraph currenrly at lines 16-24 is moved up before the paragraph currently at lines 2-15. [Gonzalez Patrick, United States of America]	Accepted, modified accordingly.
7023	5	3	5	3	Add a footnote to "high confidence" and provide the IPCC guidance on uncertainty and confidence statements [Debra Roberts, South Africa]	Rejected, this seems inconsistent with the style guide, as such footnote we included was dropped during the compilation process of the first and second order drafts.
1817	5	3	5	3	Later you specifically write “Section X”. I suggest consistency in this nomenclature. [William Lahoz, Norway]	Rejected, this reference style to chapter sections in the Executive Summary is a standard required approach, and clearly understood. Within the chapter text, we include "Section" to avoid confusion since we have there citations as well.
38957	5	4	5	4	Provide a clear definition for dryland in the Executive Summary. [, United States of America]	Accepted. We accepted your comment and added a new sentence including the definition of the drylands as follows: "Dryland areas, which consist of arid, semi-arid, dry sub-humid and hyper-arid areas, are also expected to become more vulnerable to desertification due to increasing number, frequency and intensity of extreme climatic events (high confidence) {3.2.1, 3.3.2, 3.6.1, 3.6.2}."
38959	5	4	5	4	The definition 'Desertification is land degradation in drylands' seems confusing and misleading. If desertification is land degradation why not include in Chapter 4? This definition seems inadequate and circular. [, United States of America]	Rejected, the difference between desertification and land degradation is not process-based, but geographic. This chapter focuses on desertification, which is land degradation in drylands. Chapter 4 focuses on land degradation outside drylands, and some overarching concepts such as Land Degradation Neutrality. This structuring into separate chapters on desertification and land degradation was given by the scoping process and its approval.
31915	5	4	5	4	Given the confusions, controversies and territoriality around the term "desertification", it is surprising that IPCC is giving it such unfocussed treatment , especially when a degree of rigor is emerging in some commentaries. Page 8, lines 7-8 is hardly a justification ("....although land degradation occurs anywhere across the world, it is defined as desertification when it occurs in drylands..."). "Dryland degradation" alone is appropriate to reflect the commentaries by experts. More generally, the chapter does not reflect the current opinions but plays into the outdated narrative of spreading deserts etc. which was first questioned in 1994 (Thomas and Nicholson, Desertification: Exposing the myth. Wiley) and most recently in Behnke and Mortimore 2016 "The End of Desertification?" Springer. [Stephen Prince, United States of America]	Rejected. Thank you for your perspective. Assessment of this chapter treats desertification in accordance with UNCCD definition,which is dryland degradation (consistent with your comment). We are far from following outdated narrative of spreading deserts; in fact, the definition and accompanying explanation indicates that we look at all forms of dryland degradation (as per our definition). We do cite sources which such as Behnke and Mortimore 2016, and have a discussion around this debate in Section 3.2.4.3. on desertification paradigms.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
31917	5	4	5	4	Far too abbreviated definition. It gives no indication of the need for the specific term, and inclusion of a whole chapter of the Report. I suggest: "Desertification is land degradation in drylands caused by human activities, frequently exacerbated by environmental factors. The degradation may be reversible by changes in management or natural changes in the environment, but permanent degradation can occur from which the land cannot recover." This should be followed by a detailed account early in the main report. [Stephen Prince, United States of America]	Noted, the definition of desertification is linked to the definition of land degradation (in the same paragraph), and together they give a comprehensive explanation how both are defined in this report. There is no fundmental difference/inconsistency between the current definition that we provided, and your suggestion.
41513	5	4	5	5	The affirmation " Desertification is land degradation in drylands, and the range and the intensity of desertification [Cristobal Felix Diaz Morejon, Cuba]	Rejected, unfortunately the comment cannot be understood, it is not complete.
6843	5	5	5	9	In section 3.3.1.2, there are no keywords such as “aridity index” and “1951-1980”. It is suggested that the relevant text and literature be added to the main report. [Changke Wang, China]	Accepted, consistency between ES and the chapter content is implemented.
7017	5	5	5	9	Why do you have a mixture of countries and regions? You should preferably stick to either regions or countries [Debra Roberts, South Africa]	Accepted. We have corrected many of these kinds of usage as "dryland areas."
30069	5	5	5	9	This sentence is gramatically incorrect. We think the last part "as compared to the period of 1951–1980" should be removed. Also because there is no mention of the period 1951-1980 in section 3.3.1.2. [, Netherlands]	Thank you for your comment. This part of the paragraph was deleted and whole paragraph was rewritten by considering the reviewer comments including your comment.
30071	5	5	5	9	In our view this claim cannot be made based on section 3.3.1.2. In section 3.3.1.2 nothing is said about the aridity index. In section 3.3.1.2.1 it is said that the Horn of Africa and parts of northern Africa experienced drying over the last three decades. This is not the same as eastern Africa mentioned in this statement. Except for the Mediterranean area and northern India it is not clear how expansion of drylands in the past three decades can be derived from section 3.3.1.2 for all the other regions mentioned. [, Netherlands]	Accepted. Thank you for your comment. This part of the paragraph was deleted and whole paragraph was rewritten by considering the reviewer comments including your comment. Regional sections (3.3.1.2. Regional Scales) were also changed and expanded with the assessments of many regions that were not in the old version of the Chapter 3 (SOD).
23227	5	5	5	9	AI is not used in 3.3.1.2. Is this part based on lines 11-12 in page 18 of Chaper 3 (Section 3.3.1)? (also in SPM A5.2) [Kaoru Tachiiri, Japan]	Accepted, consistency between ES and the chapter content is implemented.
25225	5	6	5	6	Aridity Index (AI) [Alexander Erlewein, Germany]	Acepted. We have corrected it at the beginning of the section.
5061	5	7	5	7	In this sentence, the Sahel, Zambia and Zimbabwe are mentioned as the areas that have experienced expansion of drylands during the last three decades. The sentence in P3-22, Line 25, however, mentions "whereas wetter conditions were experienced in central Africa and the Sahel". We would like to request clarification of this inconsistency. (SPM P11, Line 11 has same problem) [, Japan]	Noted. Thank you for your comment. This part of the paragraph was deleted and whole paragraph was rewritten by considering the reviewer comments including your comment.
863	5	7	5	7	Drylands have not been extended in the Sahel, at least not since the 1980s as the Sahel has been greening during this period. I also doubt that this claim is valid for eastern Africa, Zambia or Zimbabwe. [Tor A. Benjaminsen, Norway]	Noted. Thank you for your comment. This part of the paragraph was deleted and whole paragraph was rewritten by considering the reviewer comments including your comment.
23799	5	9	5	12	The two sentences here are unclear and seem contradictory. It is first stated that CO2 fertilization would help increase productivity of drylands and mitigate desertification, but the next sentence on desertification hotspots seems to imply the opposite [, India]	Accepted. Clarified.
24739	5	9	5	15	what is the balance between the 2 sentences, one about CO2 fertilization effect and the last one about increasing in extreme events? [Annalisa Cherchi, Italy]	Accepted, clarified

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5063	5	10	5	11	"10%" in the sentence "Biomass productivity-based desertification hotspots currently cover about 10% of the drylands..." seems to have been derived from Section 3.2.1 (P3-10, Line 11). In section 3.2.1, however, we can find another value (28%) from Bai et al. (2008) as the ratio of the area with biomass productivity loss in drylands. Please clarify why 10% is picked up in the Executive Summary instead of 28%. Furthermore, Le et al. (2016b) cannot be found in References. Please check and modify. [, Japan]	Noted. Bai et al (2008) 28% referred to share of drylands in total global area of degraded land (in fact, we re-checked this number in the publication, and corrected it to 22%). Le et al (2016) (now given in the reference) referred to area of the drylands that have such vegetation declines. When you convert the 22% to the area of drylands with vegetation declines, it is consistent with Le et al (2016) and is 9.7%, i.e. both papers point to about 10%.
21085	5	10	5	11	what are biomass productivity-based desertification hotspots? [, United Kingdom (of Great Britain and Northern Ireland)]	Accepted. Changed as declines in vegetation productivity.
31919	5	10	5	12	The global extent of desertification is contraversial owing to the difficulty in measurement. Reductions in biomass productivity, sometimes used as an indicator, currently cover about 10% of the drylands directly affecting about 277 million people {3.2.1, 3.3}. However the proportion of this attributable to human activities is largely unknown." [Stephen Prince, United States of America]	Rejected, the papers which give these numbers remove rainfall dynamics, and one also removes CO2 fertilization effect, hence they indicate that these are due to human factors. We indivated these findings as limited evidence, medium agreement to indicate at the lack of information on this issue.
5065	5	11	5	12	In the sentence "Biomass productivity-based desertification hotspots currently cover about 10% of the drylands, directly affecting about 277 million people.", "10%" seems to be derived from Section 3.2.1 (P3-10, Line 11), and "277 million people" from Section 3.2.3 (P3-12, Line 21), cited from the same paper Le et al. (2016b). According to Section 3.2.1 and 3.2.3, 10% is the record between 1980s and 2000s, and 277 million people are the data between 1982 – 1984 and 2004 – 2006. "Currently" seems unsuitable. We would suggest modification of "currently" or specification of time frame for clarity, or selection of more recent data for the ES. [, Japan]	Accepted, we dropped currently. Unfortunately, no more recent published data is available to replace this.
38961	5	12	5	13	Awkward phrasing. Reads as if "Future climate changes" are the things with increasing frequency and not extreme weather events. Rephrase to "Due to increasing frequency, intensity and scales of extreme weather events, for example droughts and heat waves, future climate changes are expected to ..." [, United States of America]	Thank you for your comment. This part of the paragraph was deleted and whole paragraph was rewritten by considering the reviewer comments including your comment.
8235	5	12	5	15	The statted confidence level is consistent with one given in SR1.5 with regards to projected droughts as a results of 1.5°C to a 2°C global warming. [Noureddine Yassaa, Algeria]	Noted. Thank you for your comment. This part of the paragraph was deleted and whole paragraph was rewritten by considering the reviewer comments including your comment.
5067	5	15	5	15	The confidence level of this sentence (high confidence) does not correspond with that in P3-45, Line 7 (medium confidence). [, Japan]	Rejected. Page 45, line 7 quotes "medium confidence" from the IPCC 1.5 degree report concerning increases in aridity in the Mediterranean and Southern Africa regions. Here we give high confidence to increase in frequency and intensity of extreme weather events increasing the vulnerability and risk of humans and ecosystems to desertification. No change.
38963	5	16	5	17	Rather than 'context-sensitive' which is hard for non-technical readers to understand consider 'varies from place to place'. [, United States of America]	Accepted, changed to "varies from place to place and through time"
31921	5	16	5	17	"Context-dependant" is not clear. How about, "The extent and nature of climate effects on desertification vary between regions." [Stephen Prince, United States of America]	Accepted. "Context dependent" changed to "varies from place to place and through time"
18329	5	16	5	20	The evidence is not clear in section 3.3.2 to support the statement that "the role of CC is parger than previously estimated". [Edouard Davin, Switzerland]	Noted. Throughout section 3.3.2 the earlier studies tend to attribute more of the desertification to human interference in the landscape, while later studies tend to attribute more to climate and CO2 (together making climate change). Hence the medium confidence that the role of CC is larger than previously estimated.
38965	5	16	5	24	What about a mention of groundwater table level and dynamics? [, United States of America]	Accepted, groundwater included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
31923	5	16	5	24	If the suggestion for change in lines 16-17 is not accepted, then it would be best to change the order of the climate (lines 17-20) and anthropogenic facors (20-24) to avoid the suggestion that human factors are additional, but not necessary factors. [Stephen Prince, United States of America]	Noted. "Context dependent" was changed to "varies from place to place and through time"
38967	5	17	5	18	Rephrase to "particularly through increase in both land surface air temperature and evapotranspiration". [, United States of America]	Accepted.
41515	5	19	5	19	I suggest change " in causing desertification " by " in contributing to desertification" [Cristobal Felix Diaz Morejon, Cuba]	Rejected. The purpose of this paragraph is on discussing causal links, hence "cause" is appropriate here.
27021	5	21	5	22	Regarding the phrase "unsustainable land management practices and increased pressure on land from population and income growth", we wonder if it includes the problem of (over)grazing by livestock. If so, we suggest mentioning overgrazing, or referring to later chapters where it is exemplified in more detail. [, Germany]	Accepted. Yes - unsustainable land management practices includes overgrazing by livestock. This is now stated explicitly in section 3.2.4.2 which is referred to.
7021	5	22	5	23	The linkage between income growth, poverty and migration and land degradation is not apparent. Perhaps consider 'income growth, poverty and migration under a changing climate contribute to unstainable land management practices thus exacerbating desertification'. If this reformulation is accepted, you need to reconsider the associated confidence statement. [Debra Roberts, South Africa]	Accepted, related assessment included.
5069	5	23	5	23	The current Executive Summary mentions "Poverty and migration also exacerbate desertification under a changing climate." It can be confirmed that migration exacerbates desertification from the sentence at P3-16, Line 35: "Out-migration will have several contradictory effects on desertification." However, it cannot be concluded that poverty also exacerbates desertification from "Climate change will exacerbate poverty..." in P3-16, Line 27. Request clarification of causation. [, Japan]	Accepted, clarified. The connection from poverty to desertification is in the following lines that state "There is high confidence that poverty limits both capacities to adapt to climate change and availability of financial resources to invest into sustainable land management". We indicated the sections where the underlying assessment is presented.
21087	5	25	5	26	The text does not seem to recognise the conclusion of the work of Rotenberg and Yakir (2010), cited within the section on albedo, who concluded that in some context (with low cloud cover) the effect of decreased tree cover and the associated surface roughness and thus latent/heat fluxes could lead to mitigation of climate change. Please ammend to include this conclusion. E.g. in their abstract: "Desertification over the past several decades, however, contributed negative forcing at Earth's surface equivalent to ~20% of the global anthropogenic CO2 effect over the same period, moderating warming trends." [, United Kingdom (of Great Britain and Northern Ireland)]	You are correct. Text has been changed to include "Desertification also tends to increase albedo, decreasing energy available at the surface and associated surface temperatures, producing a negative feedback on climate change (high confidence)."
5071	5	29	5	29	Referred section (3.6.2) seems not to point out "since 1948" as indicated in this sentence. Request clariifcation of which cited section, or deletion of this phrase. [, Japan]	Thank you. "since 1948" has been added to section 3.6.2
17685	5	31	5	31	Which are the "other areas"? Any other areas in the world? Or compared to the same areas before dryness took over? [, Sweden]	Noted, we mean both.
25149	5	32	5	32	increase, not increases (Vegetation cover and drying of surface cover i...) [Alexander Erlewein, Germany]	Accepted.
5751	5	34	5	35	aerosol cannot be used as nuclei and thus increases precipitation! [Sanaz Moghim, Iran]	Noted. unfortunately, we could not understand this comment, no action taken.
17687	5	35	5	36	The scale (geographical and temporal) of such cooling effect should be mentioned here, for clarity. [, Sweden]	varies depending on size and intensity of dust storm. No change made.
25015	5	35	5	37	How much cooling? it is suggested to clarify the level of cooling to avoid any misleading interpretation [Binaya Shivakoti, Japan]	varies depending on size and intensity of dust storm. No change made.
13481	5	35	5	37	It is being suggested that the statement be revised to properly reflect the fact there are contrasting findings. There should be a better way to say it that "being contested". [Lourdes Tibig, Philippines]	Accepted, "contested" is changed to "disputed"
31925	5	36	5	36	Delete "storms" [Stephen Prince, United States of America]	Accepted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8237	5	36	5	37	Please provide level of confidence. [Noureddine Yassaa, Algeria]	confidence phrase added.
31927	5	38	5	38	It is not the "interaction" that causes these, rather desertification itself. Delete "The interaction of climate change and…" and replace with "Desertification reduces the provision of dryland ecosystem services… [Stephen Prince, United States of America]	Rejected: we considered that the interactions between CC and Desertification increased the reduction of ecosystems services. See section 3.5.1.
25151	5	38	5	39	interactions, plural: The intercationS of climate change and desertification reduce the provision of dryland ecosystem services and lower… [Alexander Erlewein, Germany]	Accepted, the interactions are in plural
31929	5	39	5	40	The text mixes up ecosystem services with its components. I suggest deleting "..and lowers ecosystem health, including loss of biodiversity, affecting food security and human well-being…" [Stephen Prince, United States of America]	Rejected: we include the components of ecosystems services for give emphasis in these components.
38969	5	41	5	41	Say 'cause substantial reductions' or quantify in some way. [, United States of America]	Rejected: I do not sure that the models expected "substantial" reductions. We reported an expected crop reduction between 11 to 18% by 2055 compared with 1996-2005 (Page 47 L1-11).
5073	5	42	5	42	Three regions and year 2055, mentioned in "...increase in soil erosion, and soil salinity in dryland areas in Latin America, Caribbean and sub-Saharan Africa by 2055." could not be found in cited Chapter; and therefore, request clarification of references. [, Japan]	Accepted: We moved these sentences to future projections (Page 47 L1-11). Therefore, we changed the cited section {3.6.2.}
11797	5	38	6	7	The argumentation for this point has improved much, well done. However, if the information on wildlife is limited to Africa - please specify [Hans Poertner and WGII TSU, Germany]	Accepted: "Wildlife in Africa…"
12431	5	38	6	7	Talking about high risk for biodiversity is very important (e.g. represented in a burning ember analysis with a narrative quantifying the risk transitions?), however, the underlying information would benefit from adding magnitudes of change. Otherwise giving the year 2055 as a timeline is virtually meaningless, if you cannot say how much things will have changed by then. [Hans Poertner and WGII TSU, Germany]	Accepted: we add: "The climate change could cause the loss of 17% and 8% of species for shrubland and hot desert, respectively by 2050 (low confidence) {3.6.2.}"
23801	5	1	7	34	The executive summary for Chapter 3 is too genric overall. Most of what is said about sustainable land or environmental management is well know. As many or most policy makers would only read the executive summary, it would be a good idea to provide some substance in the form of quantified data on the extent and threats from desertification both at global and regional scales in the context of changing climate. Those numbers are available in the main body of the chapter, but the key figures should be reflected in the executive summary as well. [, India]	Accepted, we tried to provide these numbers as much as possible. Many of these numbers come from single studies (difficult to aggregate or compare within a range in most cases), so providing findings of a single study in the Excutive Summary may not allow attaching any confidence language to it.
38953	5	1	7	34	In general the summary is good, but still too technical. Try to simplify throughout. Better to be a little less precise and much more acccessible. [, United States of America]	Accepted, we simplified the technical language further.
38955	5	1	7	34	Highly recommend a summary bullet linking warming levels to dryland impacts. For example, "Research has shown that limiting warming to 1.5 vs. 2°C will have XYZ benefits. Allowing temperatures to reach 3°C will have XYZ consequences. If attempted emissions reductions fail and a 4°C threshold reached, catastrophic impacts of arid land ecosystems, populations and livelihoods are very certain. Under large warming scenarios, it will likely be very difficult to enact effective LSM interventions in ways that will overcome the effects of climate change." [, United States of America]	Accepted, included the projections of vulnerable and exposed population under different scenarios.
8247	5	1	7	34	what would be the impacts of policy frameworks promoting climate change mitigation on combatong desertification. What would be the benefits and trade-offs; [Noureddine Yassaa, Algeria]	Accepted, discussed in Section 3.5.2 and 3.7.4

Comment No	From Page	From Line	To Page	To Line	Comment	Response
28317	5	1	160	19	This chapter has been greatly enhanced since the FOD, and progress has been made in distinguishing it from Chapter 4 land degradation. However there remains problems in use of terms and definitions. The greatest clarity comes when the definition of desertification embraces in spirit at least the UNCCD definition (which focuses on drylands). More work between these chapters is required to help keep these definitions clear. [Barron Joseph Orr, Germany]	Accepted, definition here is the UNCCD definition focusing only on drylands. We added explanation about the difference between desertification and land degradation.
8945	5	1	160	19	Although it has been improved compared to FOD, The UNCCD SPI reviewers would strongly recommend the authors provide a very clear definition of desertification that works here and in the other chapters. Ideally, this would be an adoption of the UNCCD definition (which focuses on drylands), to avoid any confusion with Land Degradation chapter. Moreover, the UNCCD SPI reviewers would recommend to clearly specify that although actual deserts are located in drylands, they are not, by virtue of being dry, considered as the areas prone to desertification, but should be considered as areas risky in the conditions of global warming. [Jean-Luc Chotte, France]	Accepted. The chapter's definition of desertification follows the UNCCD definition. We clarified on deserts as you suggested.
12427	5	2		15	Both observations and projections are very relevant and would need to be complemented by a better understanding of the magnitude and direction of change. [Hans Poertner and WGII TSU, Germany]	Accepted, we included more quantification throughout the Executive Summary to the extent that the available evidence allowed.
6925	5	6			"has already occurred" - please include time frame: since satellite observations? Since recorded history? [Debra Roberts, South Africa]	Noted, this sentence was deleted.
12429	5	27		32	This is exactly the kind of quantified information that is needed. [Hans Poertner and WGII TSU, Germany]	Noted.
5075	6	1	6	1	The current Executive Summary uses "synergistic", while cited section 3.5.1.2 uses "knock-on". The meaning of these words do not seem identical; and therefore request use of the same words in Executive Summary and cited sections. [, Japan]	Accepted: we used knock-on term as in the section 3.5.1.2.
38971	6	1	6	1	Remove 'synergystic'. The word is not needed, and rather than adding precision makes the report less accessible. [, United States of America]	Accepted: we changed the synergistic by knock-on (see comments 5075)
31931	6	1	6	1	Why only "synergistic"? Delete. [Stephen Prince, United States of America]	Accepted: we changed the synergistic by knock-on (see comments 5075)
17689	6	2	6	2	Assumedly, it is not ecological cascades which are disrupted, but rather the meaning is "which can potentially lead to disruptive ecological cascades". Please revise as appropriate. [, Sweden]	Accepted: the sentence changed by: “which can potentially lead to disruptive ecological cascades”
21091	6	2	6	2	ecological cascades'? Could this be 'food chains'? [, United Kingdom (of Great Britain and Northern Ireland)]	Reject: ecological cascades is defined in the glossary.
4133	6	3	6	3	Considering that the concept “ecosystem services” refers to multiple benefits that humans receive from a given natural environment, this phrase should say: will bring high risk for the loss of ecosystem services and…. [Eugenia Gayo, Chile]	Accepted: we added "the loss of"
41517	6	4	6	4	I propose to add " temperature rise " [Cristobal Felix Diaz Morejon, Cuba]	Rejected: the majority of the studies did not report a clear effect of temperature rise on ecosystem services losses.
2823	6	5	6	6	"…changes in dryland areas…".i.e. remove plural "s" from "drylands" [Bettina Weber, Germany]	Accepted: remove the plural from drulands
21093	6	5	6	6	Suggests here that expansion of drylands will result in a 'change' in area affected by desertification. Suggest 'increase' is better. Lines 29-30 of p5 suggest this is the case. [, United Kingdom (of Great Britain and Northern Ireland)]	Rejected: Since we are not sure about expansion of drylands due to CO2 fertilization effect, and expansion in drylands will not automatically translate into more desertification, keeping “change” is better than shifting to “increase”.
31933	6	5	6	7	These 3 lines belong in the section page 5, lines 12 - 15. [Stephen Prince, United States of America]	Accepted: these lines were deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21757	6	6	6	7	"… in articulate from 1.5 to a 2 C global warming " tis sentence would appear to indicate that a low global warming (1.5 to 2 C) will have a lesser effect than a more serious global warming of e.g. a 3 C warming. - is this what is meant? [Graham von Maltitz, South Africa]	Noted, these lines were deleted.
8239	6	6	6	7	Comaparison between 1.5°C and 2°C global warming should not be emphazised since it is not the mandate of SRCCL. [Noureddine Yassaa, Algeria]	Accepted: these lines were deleted.
17691	6	8	6	8	Is this a quantitative estimate (Likely as in 66–100%), based on expert judgement? Which levels of climate change/warming does it correspond to? [, Sweden]	Accepted, changed to confidence level. That sentence was thoroughly revised. Human pressures are already visible, so any global warming level will add to this.
38973	6	8	6	8	"many dryland populations" could be interpreted to mean 'all populations'. [, United States of America]	Noted. There is no such combination of words in the cited lines and the chapter as a whole.
31935	6	8	6	9	"Increasing population pressures, desertification and climate change are likely…". Desertification, should be added since the Report is about that, not just population pressure and climate change. [Stephen Prince, United States of America]	Accepted, changed as increasing human pressures on land.
6927	6	8	6	10	Long complex sentence. Please consider rewording. E.g. "…likely to push dryland populations beyond their adaptive limits. Policy interventions will be required to maintain and strengthen their resilience and adaptive capacities." [Debra Roberts, South Africa]	Accepted, modified.
31937	6	8	6	17	Lines 8 - 11 make a different point from the rest of the paragraph (lines 11 - 17). The issue of degradation beyond resilience is a separate, and very important, issue (it is dealt with formally in the IPBES LDR assessment, Chapter 4.1.2). The topic of resilience and irreversibility should be added to page 5, line 4 (see separate comment on this line above). It actually deserves a separate section since it is fundamental to an understanding of the nature and possible multiple types of desertification. If IPCC take a different view, then it is very important to say so, referencing the IPBES statement. The rest of this paragraph is commented on next. [Stephen Prince, United States of America]	Noted. This paragraph was thoroughly revised. The resilience concept is discussed in depth in Chapter 4. We referrred to Ch 4.
31939	6	8	6	17	This paragraph, apart from the first line, is a separate topic (migration). It stands alone, without the need for the current heading (which is on a totally different topic). [Stephen Prince, United States of America]	Accepted, this paragraphs discusses about various socio-economic impacts through which lower resilience and adaptive capacities are seen. Migration is both an impact, but also a response. We separated this out more clearly now and also added on other dimensions, such as gender and poverty.
3817	6	9	6	10	Replace "autonomous adaptation, requiring" By "autonomous adaptation. While ways to achieve in the near future a controlled stabilisation, next a reduction, of the population density should be explored and encouraged, this situation requires" [Philippe Waldteufel, France]	Rejected, policy prescriptive.
865	6	11	6	14	The claim that climate change and desertification contribute to migration and conflict remains speculative with very little evidence to support it. [Tor A. Benjaminsen, Norway]	Acceped, the uncertainty language is included.
38975	6	12	6	12	Delete 'in interaction with other contextual factors' ... it is implied. [, United States of America]	Accepted, deleted.
22535	6	13	6	14	Migration might as well occur due to lack of or failure of adaptation rather than as an adpatation response per se, the following sentence mentioning that environmnetally-induced migration is complex cautions against a direct impact. Consider reframing. [Anastasios Kentarchos, Belgium]	Accepted, two aspects regarding migration as impact and response separated and given specific IPCC uncertainty levels.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5077	6	17	6	17	The confidence level of this sentence (high confidence) does not correspond with that in P3-42, Line 44 (medium agreement). Suggest modification for consistency. [, Japan]	Accepted, consistency checked. Sentence was thoroughly revised.
31941	6	18	6	18	Confusing! This is another aspect of the climate's role in (1) desertification through its interaction with human-caused degradation and, (2) Further (or other aspects of) climate together with existing desertification. See comment on the entire chapter (2nd comment above). [Stephen Prince, United States of America]	Noted. Both climate as such and climate change interact with desertification. The use of term climate change-desertification interactions is consistent with this understanding.
8241	6	18	6	23	Future projected dust storms and their porjected future rsiks on different components need to be assessed with availablle science. Their attribution to the future radiative forcing in short, mid and long terms.needs to be assessed. [Noureddine Yassaa, Algeria]	Accepted, we assessed the available literature on climate change impacts on dust storms, and added a statement in the Executive Summary. The available literature on this important topic is scarce, this is a critical knowledge gap.
6809	6	24	6	35	In the executive summary, Site-specific technological solutions, based both on new scientific innovations and indigenous and local knowledge, are available to avoid, reduce and reverse desertification, simultaneous contributing to climate change mitigation and adaptation, but on page 48, line 16 The 54-page, 33 line mainly assesses technologies for combating desertification. There is no assessment of how to adapt and mitigate climate change. It is inconsistent with the executive summary and please revise and add it. [Changke Wang, China]	Noted, we specifically selected those technologies which help with desertification while at the same time contribute to climate change adaptation and mitigation.
38977	6	24	6	39	This section is excellent. [, United States of America]	Noted, thank you.
25017	6	25	6	25	Are the available site specific technologies adequate? Suggest to clarify what new solutions/approaches are necessary to avoid, reduce and reverse desertification and for CC adaptation/mitigation [Binaya Shivakoti, Japan]	Accepted. The level to which site specific technologies address aspects of desertification is described further in the paragraph and Section 3.7.1.
25153	6	34	6	35	"Rangeland management systems […] increase...", plural, no s [Alexander Erlewein, Germany]	Accepted. Ammended accordingly
38979	6	34	6	35	Should read "Rangeland management systems such as sustainable grazing approaches and re-vegetation increase rangeland productivity." [, United States of America]	Accepted. Ammended accordingly
31943	6	35	6	35	(high confidence) see IPBES LDR assessment. [Stephen Prince, United States of America]	Accepted. Ammended accordingly
11803	6	37	6	39	Using past tense indicates that such programs no longer have the effects described here, which is not this the case according to the related sections [Hans Poertner and WGII TSU, Germany]	Accepted. Ammended accordingly
25155	6	38	6	38	"helped" -> help, as present tense was used before in this section [Alexander Erlewein, Germany]	Accepted. Ammended accordingly
27025	6	39	6	39	The term "aeolian desertification" seems to be not so common worldwide. We suggest changing it into "desertification triggered by aeolian processes" to give more clarity. [, Germany]	Accepted. Ammended accordingly
31945	6	41	6	42	Extraordinary (and unmerited) precision! Add some qualifiers such as "may be", "has been suggested to" [Stephen Prince, United States of America]	Accepted. Ammended accordingly
38981	6	42	6	42	Perhaps mention that food and economic security also increased. [, United States of America]	Accepted. Ammended accordingly
38983	6	42	6	43	Should read "Despite their benefits in addressing desertification, and mitigating and adapting to climate change, many ..." [, United States of America]	Accepted, changed.
32837	6	43	6	43	Delete "property rights" and insert "tenure". Relationships with land are not always in the form of property "rights". [Doreen Stabinsky, United States of America]	Accepted. Ammended accordingly
5753	6	44	6	44	is it right!"climate change and desertification negatively affects wildfire" [Sanaz Moghim, Iran]	Rejected. Line 44 does not exist on page 6. No such text is found in the Chapter.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21089	6	1	7	1	GENERAL comment on exec summary - 1st sentences tend to be overly long. Shorter sentences would be easier to understand and make the report more readable. [, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, modified.
8243	6	40	7	2	Sustainable Ground water use should be taken into accound in the programmes of land restoration and rehabilitation in dryland areas. [Noureddine Yassaa, Algeria]	Accepted, included.
12433	6	8		17	Bullet point should be clear that it is talking about human population. Can something be said about the limits of adaptation and which drivers are eliciting migration in the first place or even rank those drivers? Also can "typical" limiting conditions and an associated mix of drivers in relation to climate change be identified that cause the onset of large scale migration? [Hans Poertner and WGII TSU, Germany]	Accepted. We have added a discussion on limitis to adaptation in section 3.7.4
11799	6	8			"population pressures": This statement sits between a biodiversity statement and a statement about human wellbeing, so here please clarify that this is about human populations, not plant/animal populations [Hans Poertner and WGII TSU, Germany]	Accepted, modified to "increasing human pressures".
27023	6	9			Please avoid policy prescriptive language and reformulate "requiring policy interventions". [, Germany]	Accepted, changed.
12435	6	18			Information on frequency, intensity and scales of dust storms would benefit from quantification. [Hans Poertner and WGII TSU, Germany]	Noted. We provided numbers whenever available. Climate change impacts on dust storms is a knowledge gap.
11801	6	23			The sun "generates" solar energy; perhaps "harvesting infrastructures" would be a better expression [Hans Poertner and WGII TSU, Germany]	Accepted, modified.
12437	6	24		25	Can indigenous and local knowledge be specified by examples? [Hans Poertner and WGII TSU, Germany]	Accepted, included.
12441	6	24		39	Can something be said about adaptive capacity, risk reduction by adaptation, limits to adaptation, and residual risks? [Hans Poertner and WGII TSU, Germany]	Thanks. A discussion of these issues is provided at the end of section 3.7
6929	6	38			It would be helpful to list in the SPM other methods (key words or terms) by which desertification can be reversed, not only to reduce sand storms but create habitable and productive land in current desert areas. Methods exist to make completely unproductive land productive again. This has multiple co-benefits e.g. reducing pressure on land that is still productive. Such radical solutions should feature strongly. [Debra Roberts, South Africa]	Noted.We included discussion of SLM technologies for reversing desertification. Since our focus is on desertification, we did not focus on deserts.
12439	6	39			aeolian desertification needs example to support understanding. [Hans Poertner and WGII TSU, Germany]	Accepted, changed to wind erosion.
6931	6	40			This is highly relevant for decision making. Can the investment returns data be expanded and elevated more? [Debra Roberts, South Africa]	Accepted, we have added more information and highlightd this topic further.
32839	7	1	7	1	Delete "private". Incentives may be public or private. [Doreen Stabinsky, United States of America]	Accepted, modified as "insufficient incentives to private land users"
8245	7	3	7	4	why it is medium confidence and not high confidence. [Noureddine Yassaa, Algeria]	Noted. This is because many ILK practices are increasingly unable to cope with human demand pressures, as indicated within the paragraph.
31947	7	3	7	4	Not always so! What about transhumant herding and sedentary farmers in Sahel, where "tradition" has led to serious degradation and conflict? As before, a qualifier such as "often", or "sometimes" would deal with this potential misleading statement. Lines 7-8 express this point clearly. [Stephen Prince, United States of America]	Noted. We share this idea of "not always", this is the reason why we used medium confidence for this statement. The statement is not misleading as such, but we further clarified by adding often.
32841	7	3	7	11	The equation of traditional knowledge with agroecology is erroneous. Agroecological methods are based on ecological processes and relationships, as is indigenous and TK, but agroecology is certainly much more than just TK. The equation is false and should be modified to be consistent with a broader use of the term agroecology. [Doreen Stabinsky, United States of America]	Accepted, wording equating ILK with agroecologicy deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4135	7	3	7	11	Ideas and evidences presented in this paragraph overlap considerably with a previous section of Executive Summary (page 6, lines 24-39). Hence, it seems more adequate to merge these both statements. [Eugenia Gayo, Chile]	Rejected. The previous paragraphs lists those technology groups and discusses about their biophysical benefits. Thsi paragraph discussion on their economic dimensions and the barriers for wide-scale adoption. These are related but distinct topics, so it is better to keep them close but separate.
31949	7	5	7	5	Delete either "historically developed" or "traditional" [Stephen Prince, United States of America]	Accepted, historical deleted.
31951	7	5	7	5	Once again, confusion of climate change and desertification. Better to say "…combined challenges of desertification and climate change.." [Stephen Prince, United States of America]	Rejected, no such phrase in referred lines. A closely similar phrase is in line 10, which says "...combined challenges of climate change and desertification". Changing the places between climate change and desertification does not change the meaning, and it is not clear why this is a confusion.
41519	7	7	7	8	I propose add - Traditional agroecological practices alone (only) are also increasingly unable to cope with growing [Cristobal Felix Diaz Morejon, Cuba]	Rejected, adding "alone" will not change the meaning of the sentence in a broad sense, but adds a nuance confronting them to "non-traditional" practices which is not the intention of this sentence.
21761	7	8	7	8	What is meant by "growing demand pressures"? [Graham von Maltitz, South Africa]	Accepted, clarified, mostly demand coming from food production.
11805	7	8	7	11	This confidence assessment has no link to a chapter section - please add for transparency the section which contains the information that supports this statement. [Hans Poertner and WGII TSU, Germany]	Accepted, clarified.
13483	7	10	7	11	Check confidence level (medium evidence, medium confidence) [Lourdes Tibig, Philippines]	Accepted, done.
25197	7	12	7	12	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, corrected.
5079	7	12	7	22	Executive Summary mentions the importance of the innovative combination of indigenous and local knowledge and modern agronomic practices in P3-7, Line 3. Suggest also including here in the Executive Summary, "Expanding access to rural advisory services" described in P3-58, Line 30. [, Japan]	Accepted, included under the paragraph discussing on policy options.
21763	7	15	7	16	Reword as " … against desertification and extreme weather events, such as drought" as it stands it could be read that desertification is a type of extreme weather event. [Graham von Maltitz, South Africa]	Accepted, modified.
5081	7	17	7	17	As the reader may not have a clear view of what "collective action" refers to, suggest adding reference or citing a definition. (One description can be found at P3-55, Line 34. "3.7.2.1") [, Japan]	Accepted. Collective action definiton is added to Glossary. Link to Section numver discussing this issue is provided in the Executive Summary.
32843	7	18	7	19	The phrase "such as those based on new information and communication technologies" doesn't make sense here and I was unable to find reference in the underlying chapter. Delete. [Doreen Stabinsky, United States of America]	Accepted, clarified.
31953	7	18	7	19	Does this apply universally? What about the disasters caused by IMF's Structural Adjustment? Maybe qualify the statement to avoid misunderstanding. [Stephen Prince, United States of America]	Noted. IMF's structural adjustment programs had numerous other elements besides access to markets, evaluating their outcomes is beyond the scope of this chapter. Our calibrated language of "medium confidence" already captures the idea that this is not true always and everywhere.
32845	7	20	7	22	For clarity delete the first part of the sentence. Delete "promoting schemes that provide" [Doreen Stabinsky, United States of America]	Accepted, modified.
25157	7	23	7	24	delete "to" in "including [to] early warning systems,…" [Alexander Erlewein, Germany]	Accepted, 'to' deleted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6933	7	23	7	26	Sentence too long and complex.It is not clear what this paragraph is saying. Is the high return only with regard to measuring progress? Can access to data and technology not have more direct benefits, such as planning interventions and timing of crop planting, etc? One can envisage mobile phone apps through which farmers can access weather, remote sensed and other data for their location. This helps them directly, and not just 'measure progress'. [Debra Roberts, South Africa]	Accepted, simplified and modified accordingly.
38985	7	25	7	26	It's great to see a callout to EWS, LSMs, etc., but as presented 'measuring progress in addressing desertification under changing climate' seems odd. Perhaps 'for enabling effective adaptation and mitigation responses that address ...' [, United States of America]	Accepted, modified.
485	7	27	7	28	I would write "help to face" rather than "help to combat". [Beatrice Marticorena, France]	Accepted partly. Human drivers are important in causing desertification, hence just "facing" is not enough, need to actively combat. For extreme weather events, we added "increase resilience against".
5083	7	28	7	28	Suggest correction of reference: 3.8.6 to Cross-Chapter Box 4 [, Japan]	Accepted, done.
41521	7	28	7	29	I suggest add - Adoption of land degradation neutrality and land sustainable management policies lead to balancing of [Cristobal Felix Diaz Morejon, Cuba]	Rejected, LDN includes SLM.
4137	7	29	7	29	Again, "ecosystem service" is used instead of "ecosystem serviceS" [Eugenia Gayo, Chile]	Accepted, modified.
25199	7	34	7	34	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, modified.
5085	7	34	7	34	Suggest correction of reference: 3.7.2 to Cross-Chapter Box 4 [, Japan]	Accepted, cross-chapter box 4 is added.
12443	7	7		11	Can something be said about adaptive capacity, risk reduction by adaptation, limits to adaptation, and residual risks in traditional agroecological practices in quantitative / semiquantitative terms? [Hans Poertner and WGII TSU, Germany]	Accepted, we have added a section on limits to adaptation. Contributions of traditional practices to adaptive capacities is in 3.7.1 and 3.7.2. Some discussion on limits of traditional practices in terms of providing for growing needs is also in 3.5.2. We could nto find quantitative information on these topic.
12445	7	12		34	Can something be said about the capacities of such policy frameworks, or institutions, e.g to contribute to risk reduction by adaptation, consider limits to adaptation, and residual risks in quantitative / semiquantitative terms? In a way, the set of minimum required environmental conditions needs to be identified which allow such frameworks to be successful, otherwise migration may be the best possible solution. Such borderline conditions which may well be region specific, would be useful to identify (quantify) and possibly even lift to the SPM. [Hans Poertner and WGII TSU, Germany]	Accepted, added on limits to adapatation in a separate paragraph. We could nto find quantitative information on these topic.
38987	8	3	8	3	While this is a technically correct definition, consider an alternative because (a) it is confusing, since there is a separate chapter on land degradation; and (b) for regular readers it is circular (i.e., many won't know what land degradation means). How about 'Desertification is a reduction in the soil and vegetation quality in arid, ...' [, United States of America]	Rejected, we understand your concern and highly appreciate this sugestion. However, we have come to this definition and such arrangement in the text specifically to explain how this chapter and the chapter 4 on land degradation are related (desertifiction is land degradation in drylands), and what is different between them (the difference is geographic, not process based). Hence, adding a separate definition may bring in more unclarity to this issue.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
867	8	3	8	3	Many of the problems with this chapter come from this definition of 'desertifcation'. It relies on a matter of fact-like treatment of 'degradation' as if everyone agrees what degradation is. This is an old discussion and it is surprising that such an elementary mistake is made in such an important report. Degradation is a highly value-laden concept, which means that a resource or a landscape is losing value. But the question is: value according to whom? A banal example is that bush encroachment is valued differently whether you are a pastoralist or someone who appreciate trees as a way to store carbon. This contradiction is present throughout the chapter and should be dealt with. At present, the chapter remains conceptually weak, becaause it adheres to a definition of desertification, which cannot be operationalised. It would be much better to take a distance to this term and say that it cannot be measured or maped as many studies have shown, and instead be more precise and discuss terms such as loss of soil fertility, bush ecroachment, overgrazing, deforestation etc. [Tor A. Benjaminsen, Norway]	Noted. The definition of desertification used here was reached after very long debates, not only within the chapter but also with Chapter 4 on land degradation. In fact, we find that this is the most effective definition for operationalizing our work, especially with regard to Chpater 4. This definiton is also consistent with international frameworks adopted by countries under the UNCCD. Not only desertification, but any issue has different intepretations and different values attached to them by individual stakeholders. The definition we apply comes from societal perspective. We discuss on the difficulty of measuring desertification (Section 3.3), we discuss on the debates around the concept (Section 3.2.4.3), we empahsize throughout the text on specific forms of desertification such as those listed by you. For this reason, for most part this chapter usually controvercial debate around the definition of desertification does not a decisive importance. Our task is to give a balanced assessment of the literature, most of the literature available follows this definition.
38989	8	3	8	13	Why not just conclude with 'Desertification reduces dryland ecosystem services' rather than 'Thus, desertification is manifested through the reduced provision of the sum dryland ecosystem services'? Such language is unnecessarily complex, and creates a LARGE barrier in terms of report accessibility. [, United States of America]	Accepted. Ammended accordingly. That sentence was dropped as it was replicating what was already said.
8957	8	3	8	13	It should be emphasized from the very beginning that land degradation in drylands (which is the desertification by the definition) has a specific context and importance (due to the lack of soil moisture, overpopulation, etc??). Otherwise it remains confusing why the report refers to Land Degradation and Desertification as separate issues. This means the chapter should be devoted not to the same issues as in the chapter related to LD, but ti the specific issues of desertification, issues of drylands. [Jean-Luc Chotte, France]	Partially accepted. We are indeed focusing on issues related to drylands, while chapter 4 is focusing on land degradation outside drylands. The separation between these chapters is geographic, and not process based (See Glossary, Section 3.2)
38991	8	5	8	6	Awkward phrasing. Change to "Consequently, although land degradation can occur anywhere across the world, it is defined as desertification ..." [, United States of America]	Accepted, done.
41523	8	5	8	7	The affirmation " Consequently, although land degradation occurs anywhere across the world, it is defined as [Cristobal Felix Diaz Morejon, Cuba]	Noted, unfortunately the comment is not complete, so we could not understand the reviewers suggestion.
31955	8	6	8	6	If this is all it is, the term "desertification" is unnecessary and confusing. Are there specific aspects of dryland degradation that justify the word, even with its checkered lineage? [Stephen Prince, United States of America]	Noted, the difference between desertification and land degradation is not process-based, but geographic. This chapter is specifically dedicated to discussing those issues relevant to drylands.
38993	8	6	8	7	Consider 'When land degradation occurs in dryland areas, it is considered desertification.' [, United States of America]	Accepted, done.
8141	8	7	8	9	It is mentioned here that desertification is used to represent all forms and levels of land degradation occuring on drylands. In this case It is not quite clear the difference between land degradation and desertification. [Haruni Krisnawati, Indonesia]	Noted. The difference between desertification and land degradation is not process-based but geographic. Land degradation can occur anywhere across the world. When land degradation occurs in drylands, it is considered desertification.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
31957	8	9	8	9	First, this contradicts line 7, which states it is not limited to irreversible forms of land degradation. Second, it appears that a distinction is being drawn between desertification and land degradation, which contradicts line 3. Third, it makes a narrow and very limited definition of “land degradation”. [Stephen Prince, United States of America]	Rejected. The definition of land degradation has been changed now to "land degradation is a negative trend in land condition caused by direct or indirect human-induced processes, including climate change, expressed as long-term reduction or loss of at least one of the following: biological productivity, ecological integrity, and value to humans". We do not see any contradictions that the reviewer alludes to neither with the old version in SOD, neither this new version. The reviewer did not explain why he considers these to be contradicting.
22537	8	11	8	11	The phrase "human values" is ambigous. [Anastasios Kentarchos, Belgium]	Acepted, changed to value to humans.
25227	8	14	8	14	aridity index -> AI, introduce abbreviation here, as it is mentioned afterwards [Alexander Erlewein, Germany]	Accepted, done.
22539	8	14	8	15	"Average annual precipitation" should be defined especially the number of years that are considered when considering the average. Is it assumed that it is the WMO definition. [Anastasios Kentarchos, Belgium]	Noted. Average annual precipitation is a standard term. Indeed, it is based on WMO definition. As per WMO definiton, average annual precipitation should be based on the minimum 30 years observation in a place or at a station. This is also defined as "normal precipitation." This AI map has been prepared by using 35-year long gridded data (TerraClimate precipitation and potential evapotranspiration (1980-2015) (Abatzoglou et al., 2018).
22541	8	14	8	15	The accuracy or representativeness of the "aridity index" is compromised by the spatial distribution of ranfall stations especially in deserts. [Anastasios Kentarchos, Belgium]	Noted. Thank you for the comment. This AI map has been prepared by using 35-year long gridded data (TerraClimate precipitation and potential evapotranspiration (1980-2015) (Abatzoglou et al., 2018), which is one of the available best data sets dealing with the AI variables in terms of the spatial and temporal representativeness.
38995	8	15	8	15	PET absolutely needs to be defined AND explained. [, United States of America]	Accepted. The PET has been defined and explained in the Glossary and in different parts of the Chapter 3 . In the Glossary, PET and ET was defined as "Evapotranspiration (ET) is the combined processes through which water is transferred to the atmosphere from open water and ice surfaces, bare soil, and vegetation that make up the Earth’s surface, while Potential Evapotranspiration (PET) is the potential rate of water loss without any limits imposed by the water supply." Reference to the Glossary is made.
25229	8	16	8	16	aridity index -> AI, if abbreviation is introduced on page 8, line 14 [Alexander Erlewein, Germany]	Accepted, done.
22543	8	16	8	17	The UNCCD, 1994 is silent on the exclusion of hyper-arid areas in the definition of desertification. [Anastasios Kentarchos, Belgium]	Rejected. UNCCD 1994 definition of desertification is given as the first sentence of this chapter. This is a verbatim reference to the UNCCD definition. It lists arid, semi-arid and sub-humid areas. Does not list hyper-arid areas, hence excluded.
24741	8	20	8	21	is there a definition to identify when a hydrological imbalance is "serious"? [Annalisa Cherchi, Italy]	Noted. Thank you for your comment, this definition is used by IPCC AR5, we understand that "serious" may mean different things to different people, it is applied here for consistency with the rest of the IPCC products in terms of terminology.
25231	8	23	8	24	aridity index -> AI, if abbreviation is introduced on page 8, line 14 [Alexander Erlewein, Germany]	Accepted, done.
1343	8	23	8	25	“Humid AI>0.65, Dry sub-humid 0.50 < AI < 0.65, Semi-arid 0.20 < AI < 0.50, Arid 0.05 < AI < 0.20, Hyper-arid AI < 0.05” should be changed to “Humid AI>0.65, Dry sub-humid 0.50 < AI ≤ 0.65, Semi-arid 0.20 < AI ≤ 0.50, Arid [Bo Wu, China]	Accepted.
25159	8	24	8	24	add blank space at "Humdi AI>0.65, …" before and after the symbol [Alexander Erlewein, Germany]	Accepted, done.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21717	8	42	8	44	The definition of desertification uses OR. This is in contradiction to the descriptions given on page 9 lines 22 to 23 which would appear to assume an AND in the definition. Given the current definition, any of the 3 different criteria being met would mean that degradation has taken place. [Graham von Maltitz, South Africa]	Accepted, paraphrased as per changes done in Chapter 4. The reviewer probably meant this comment for Chapter 4, since the referred lines 22-23 on page 9, correspond to text in Chapter 4.
40565	8		8		Missing representation of trend in aridity index (chapter 2 or chapter 3). Relevant and needed. [Valerie Masson-Delmotte, France]	Rejected, one of our key messages is that aridity index is a poor proxy for deliniating drylands under the increasing CO2 environment. Moroever, being a dryland does not automatically mean desertification. Hence, trends in the aridity index do not have such a critical importance for desertification especially under climate change.
21917	8	14	9	21	3.2. The Nature of Dessertification, 3.2.1. Introduction. The writeup did not highlight the variation or difference between Aridity and dryland before the geographical classification of dryland [Olusegun Adeaga, Nigeria]	Accepted. Dryland is defined in the section based on the UNEP and the UNFCC definition. On the other hand, we have accepted your comment on Aridity and added an Aridity definition in related place of the Introduction The term of Aridity defined in Chapter 3 was also given at the Glossary.
8959	8	2	11	18	It should be underlined somewhere in the introduction that although actual deserts are located in drylands, they are not considered as the areas prone to desertification, but should be considered as areas risky in the conditions of global warming [Jean-Luc Chotte, France]	Accepted, the idea is included.
3587	8	2			the dynamic interface degradation/desertification is not clearly spelled out. This should be taken up in an introductory paragraph… becasue it is there where the conceptual and practical approaches enter (see also comment on 3.2.4.3 [Cordula Ott, Switzerland]	Noted. Unfortunately, we cannot understand what the reviewer calls as dynamic interface degradation/desertification. The definitions of land degradation and desertification clearly contain a time element (dynamic), and we have further clarified the terms land degradation and desertification.
28645	8	3		13	Deseification is also a process by which fertile land become a desert. It is a land degradation phenomenon. A research carried out two years ago in the 15 northern state in Nigeria; Stattistics reveals that 63 per cent of the entire landscape of Nigeria across 15 northern state are presently plagued by desertification. Im 1994,the United Nations General Assembly declared every 17th of June as "World day to combat desertification and droughts ". The aim is to promote pjblic awareness of the issues and the implementation of the United Nation Convention to combat desertification (UNCCD). E.g Nigeria. 15 northern loose up to 350,000 hectares of land to desertification annually. I recommend public awareness on land use management process, land degradation to reduce forest dependency, embarking on reforestation project, sustainable land use,land adaptive measures, human awareness in what i called biodiversity mitigation process. e.g Forest and Land mitigation. Public awareness in relation to UNCCD in local,regional and global scales. e.g Semi Arid and Arid areas. [Abiodun Adegoke, Nigeria]	Accepted. Thank you your valuable comments and experiements on the desertification. We have included the discussion on the issues you highlight in Sections 3.5 and 3.7.
38997	9	1	9	3	Why not just say 'Drylands cover about 46% of the Earth's land surface? Why cite Safriel? [, United States of America]	Acepted, modified. Here we quoted 2 estimates of the extent of the drylands which provides an indication of the uncertainty associated with this figure.
25233	9	4	9	4	aridity index -> AI, if abbreviation is introduced on page 8, line 14 [Alexander Erlewein, Germany]	Accepted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22545	9	4	9	5	Is it necessarily correct that climate change will decrease the aridity index in all cases? This caveat will affect the aridity index thresholds to estimate dryland areas. [Anastasios Kentarchos, Belgium]	Sentence rearranged to better connect the AI decreases to increases in potential evaporation. It now reads "While climate change is expected to decrease the AI due to increases in potential evaporation, implying more arid conditions in the future,....". There are locations where the increase in preciptiation is larger than this increase in potential evaporation (and hence the AI can increase), however this increase in potential evaporation is ubiquitous.
25161	9	4	9	6	meaning of the sentece unclear: decrease of AI due to increased potential evapotranspiration? [Alexander Erlewein, Germany]	Sentence rearranged to better connect the AI decreases to increases in potential evaporation. It now reads "While climate change is expected to decrease the AI due to increases in potential evaporation, implying more arid conditions in the future,...."
25387	9	4	9	6	Could it be specified why these assumptions are not consistent with a changing CO2 environment ? [, France]	Text added "and the effect this has on transpiration rates", and reference to section 3.3.1 is added. Further explanaition is given there
38999	9	5	9	6	What does this mean 'the assumptions that underpin the potential evaporation calculation are not consistent with a changing CO2 environment' to a casual reader? Remove or explain. [, United States of America]	Text added "and the effect this has on transpiration rates", and reference to section 3.3.1 is added. Further explanaition is given there
21765	9	6	9	6	" .. A changing CO2 environment ". Could this not be phrased in a way that is more specific and more understandable e.g. " with a global increase level of CO2 and the effects this has on transpiration rates" [Graham von Maltitz, South Africa]	Text added "and the effect this has on transpiration rates", and reference to section 3.3.1 is added. Further explanaition is given there
21919	9	7	9	18	3.2.1. Introduction. Misuse of literature.Greve et al., 2017 and FAO,2016 [Olusegun Adeaga, Nigeria]	Greve et al. (2017) directly addresses the connection between aridity and CO2 changes. FAO (2016) refers directly to Figure 3.3 which is sourced from that publication. References used correctly. No change.
25235	9	8	9	8	aridity index -> AI, if abbreviation is introduced on page 8, line 14 [Alexander Erlewein, Germany]	Accepted, done.
25237	9	8	9	9	aridity index -> AI, if abbreviation is introduced on page 8, line 14 [Alexander Erlewein, Germany]	Accepted, done.
39001	9	9	9	9	Is the reader getting mixed messages? Authors state that soil moisture and primary productivity are the right way to measure drylands, but then the aridity index is presented here. [, United States of America]	Aridity Index has been used extensively in the literature to measure drylands and aridity in general. Hence in this literature assesssment we address this issue.
39003	9	11	9	11	Define 'primary productivity'. Or include in a box of Key Terms right at the start of the chapter. [, United States of America]	Noted. 'primary productivity' is introduced in earlier chapters.
39005	9	12	9	12	Consider adding sentence: 'While indicators like soil moisture and vegetation primary production are likely better ways to measure changes in dryland extent, the aridity index provides an easy to understand means of categorizing different areas of the globe." [, United States of America]	Thanks for the suggestion. However, the aridity index has been widely misused to understand changes in dryland extent largely because the relationship between this index and aridity in general is not understood well (despite its name). No change made.
21767	9	13	9	15	Although I know these figures are correct against FAO land cover classifications, the data is very misleading - "many drylands are shrubland or other vegetation types that are neither forest nor grassland. This is lost in this over simplistic classification of vegetation. Even the savannas are lost within this classification. These different vegetation types sometimes form part of "other lands" but often also get classed incorrectly into grasslands and forests. [Graham von Maltitz, South Africa]	Noted. Thank you. We have noted your comment and we agree with your concern. FAO land cover classification is a widely used product, we noted in the text that "other land" category is also used as pastures, Our discussion of technological responses follows more detailed biomes. Here in the introduction, FAO classification, taking into account its imperfections, gives an overall sufficiently policy-relevant overview.
39007	9	14	9	14	Awkward phrasing. Change to "... land use/cover in terms of area in drylands, if desert are excluded, are grasslands ..." [, United States of America]	Accepted, done.
31959	9	14	9	14	Add a comma after "area" [Stephen Prince, United States of America]	Accepted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
31961	9	18	9	18	Add "or irrigation" [Stephen Prince, United States of America]	Accepted, added with irrigation.
39009	9	19	9	19	"transhumance"? Simplify so that readers aren't required to consult a dictionary. [, United States of America]	Accepted, added "i.e. migratory grazing" to explain transhumance.
11807	9	22	9	24	This figure could be much easier to understand if the categories were presented the other way around, with hyper-arid at the bottom through to humid at the top [Hans Poertner and WGII TSU, Germany]	Accepted, done.
28841	9	1	160	9	In the recent study of (Koutroulis, 2019), using the 1981 - 2010 as a reference period, estimate the dryland fraction at 47%. Koutroulis, A.G., 2019. Dryland changes under different levels of global warming. Science of The Total Environment, 655, pp.482-511. [Manolis Grillakis, Greece]	Accepted, included 47% in the related sentence. Murat
2261	9	19			Please define "transhumance" in parentheses [Nina Hunter, South Africa]	Accepted, short definition added.
11809	10	1	10	5	Please explain: what "own calculations" were used here? [Hans Poertner and WGII TSU, Germany]	Noted, the sentences was changed following this and other comments.
1819	10	7	10	7	I presume the estimate between 4% and 70% is correct, but the range seems so large that I wonder if there is a typo. If the range is correct, perhaps the authors could indicate why it is so large [William Lahoz, Norway]	Noted. This is not a mistake, the author said that there is a plethora of figures ranging from 4 to 70%. This is due to differences in approaches in the expert evaluations, which has been highlighted.
31963	10	11	10	11	Add after "…located in drylands…" "However, reductions in biomass productivity do not take account of environmental causes, such as drought. [Stephen Prince, United States of America]	Rejected, Both papers we cited here account for changes in precipitation, hence for drought.
7025	10	11	10	13	What accounts for the loss? [Debra Roberts, South Africa]	Noted, anthropogenic drivers.
25389	10	11	10	13	Could "significant" be specified? [, France]	Noted, the sentences was changed following this and other comments.
25193	10	20	10	20	Normalized Difference Vegetation Index (NDVI) [Alexander Erlewein, Germany]	Acccepted, done.
11811	10	10			More than a quarter / nearly a third sounds a lot, so please explain why the statement reads "only 28%"? [Hans Poertner and WGII TSU, Germany]	Accepted, only dropped.
2263	10	20			"NDVI" - since this is first use, suggest writing out in full so that reader knows what is being referred to [Nina Hunter, South Africa]	Acccepted, done.
7027	11	2	11	2	Insert 'of' after 'mapping' [Debra Roberts, South Africa]	Acccepted, done.
39011	11	5	11	8	This critical sentence is overly complex. Consider perhaps "This assessment examines the socio-ecological links between drivers (3.2.4) and feedbacks (3.4) that influence desertification-climate change interactions, and then examines associated observed and projected impacts (3.6 and 3.6) and responses (3.7)." [, United States of America]	Accepted, done.
31965	11	14	11	14	After …(Section 3.7.2), add "and high technological activities are transforming previously desertified land (Safriel, U. (2009). Deserts and desertification: Challenges but also opportunities. Land Degradation and Development. https://doi.org/10.1002/ldr.935) [Stephen Prince, United States of America]	Accepted, we noted on technological options besides ILK. The purpose of this paragraph is to show the roadmap of the chapter and give the readers its main narrative. So we refer here to specific chapter sections. We referred to this paper in Section 3.7.1.
3819	11	14	11	15	Talking about " increasing population pressures combined with climate change" may give the impression that both factors are independent. Actually, increasing population pressures are a significant factor of man induced climate change. It would be well to recall here this positive feedback relationship, indicated on figure 1-3 [Philippe Waldteufel, France]	Noted. The areas with highest population growth rates are contributing relatively little to greenhouse gas emissions. It is not population pressure per se that is driving climate change, but high consumption.
869	11	14	11	15	Increasing population pressures combined with climate change can push dryland populations beyond their resilience thresholds ...'; has this happened anywhere? Where? Or is this only speculation? [Tor A. Benjaminsen, Norway]	Accepted, modified.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25201	11	17	11	17	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Acccepted, done. Murat
8249	11	17	11	18	How about mitigating climate change impacts on desertification. [Noureddine Yassaa, Algeria]	Accepted, discussion on this is given in Section 3.7 on responses, we referred to this here as well.
22547	11	18	11	18	It is better to inform the reader of one or two examples of "substantial co-benefits in terms of sustainable development [Anastasios Kentarchos, Belgium]	Noted, sustainable development impacts are discussed in Section 3.5.2, here we referred to it.
39013	11	19	11	19	As in the Executive Summary, ending with mitigation seems insufficient. The implication is that mitigation may be sufficient to respond to both population pressure and climate change. Consider adding a sentence "While improved land management can increase resilience and adaptive capacity, however, rapid population growth and climate change may exceed such mitigating activities." [, United States of America]	Noted, here sentence says both adaptation and mitigation, with co-benefits for sustainable development. There is no evidence for being locked-in to such pessimistic outcome. The assessment shows there are enough technological and policy solutions to overcome these challenges, what is needed is their application.
29813	11	21	11	23	There is considerable emphasis on biophysical impacts throughout the report and the emphasis on biocultural diversity is relatively light. We would be happy to work with any authors in identifying how this can be achieved in specific chapters. Louisa Maffi is a scholar who works on this concept and might also be able to provide support. [Tanya Smith, Canada]	Thank you. We noted. information was added in Section 3.5.1.
11813	11	30	11	35	Please ensure the SR15 report is cited correctly (Author names, not report name in brackets) - are you citing the SR15 SPM here, or a specific chapter? This needs to be made clear (here, and elsewhere) [Hans Poertner and WGII TSU, Germany]	Accepted, corrected.
7029	11	31	11	31	However' is not required here; please delete [Debra Roberts, South Africa]	Acepted, deleted.
7031	11	33	11	33	Consider replacing 'as' with 'with' so that it reads 'assessed with low confidence' [Debra Roberts, South Africa]	Accepted, done.
11815	11	36	11	37	Please ensure the IPBES report is cited correctly (Author names, not report name in brackets) [Hans Poertner and WGII TSU, Germany]	Noted, We followed the suggested citation in the report, which asks to cite it as (IPBES, 2018), The full reference ocntains the names of editors. "IPBES, 2018: The IPBES assessment report on land degradation and restoration. Montanarella, L., Scholes, R., and Brainich, A. (eds.). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 744 pages." Murat
21921	11	21	12	10	3.2.2.Desertification in previous IPCC and related reports. Desertificatication as a result of climate change and its impacts on Natural resources should be properly discussed from thevarious view considered. [Olusegun Adeaga, Nigeria]	Noted. This is the purpose of the entire chapter, which does so from variosu angles.
31967	12	2	12	2	Add, after IPBES (2018), "In addition, the IPBES Assessment reviews the biophysical aspects of many forms of land degradation and places desertification in an ecological framework. This account is highly relevant to this Report." [Stephen Prince, United States of America]	Noted, we have highlighted the particular relevance of IPBES (2018) in this section, and provided references to IPBES (2018) in multiple relevant locations, including when we are discussing on the forms of desertification.
25163	12	9	12	10	verb is missing in the last sentence in the section [Alexander Erlewein, Germany]	Rejected, unfortunately we could not understand the comment. We have carefully checked all punctuation marks.
39015	12	14	12	15	"38% of people live in drylands". This astounding statistic should be mentioned right at the start of the chapter. [, United States of America]	Accepted, included.
28843	12	14	12	15	In the recent study of (Koutroulis, 2019), drylands are estiamted to host 39% of the global population. Koutroulis, A.G., 2019. Dryland changes under different levels of global warming. Science of The Total Environment, 655, pp.482-511. [Manolis Grillakis, Greece]	Accepted, included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3821	12	17	12	18	This couple of lines concerns the future, whereas lines 14-15 as well as 19-23 refer to the present situation. Hence it seems logical to move lines 17-18 down to the actual line 24. Inserting then "Moreover," at the beginning of the following sentence might make sense. [Philippe Waldteufel, France]	Accepted.
39017	12	18	12	18	Seem to need another sentence here. If Figure 3.4 really does show the actual increase in millions between 2010 and 2050, then something like: "Current projections indicate that populations in all dryland regions will more than double between 2050 and 2010." Whatever the formulation, a sentence underscoring the rapid growth seems warranted. [, United States of America]	Noted. The current formulation already contains "rapidly" and gives the magnitudes, so we think it already conveys the message you suggest.
21769	12	18	12	18	the sentence " this is because of high population growth rate in drylands" is interesting, but is not explored. Why do drylands have an inherently higher population growth rate than other areas? This should deb explored. [Graham von Maltitz, South Africa]	Partially accepted, this is because 90% of population in drylands live in developing countries. This is added. Dedveloping countries have higher population growth rates than higher income countries due to numerous reasons, exploring the demographic growth rates differentials and factors behind them between developing and higher income countries is beyond the scope of this chapter.
7033	12	19	12	19	Clarify what 'MEA' is. [Debra Roberts, South Africa]	Accepted, done.
5755	12	19	12	21	desertification affecting 1billion people indirectly through what!, how! [Sanaz Moghim, Iran]	Accepted, deleted the reference to 1 billion as the evidence behind indirect effects is not strong.
31969	12	19	12	23	After "…2004-2006.", add: "However, at least because the locations and areas of desertification are hardly known, these estimates must be regarded only as uncertain estimates." [Stephen Prince, United States of America]	Noted, this is expressed as low confidence
7035	12	20	12	20	Do you have regional information for the 250 million people that are directly affected? [Debra Roberts, South Africa]	Noted, included.
39019	12	24	12	37	What about groundwater resource drawdown or changes in recharge? [, United States of America]	Accepted: we add the following paragraph (page 35 L12): Globally, the groundwater has been reduced since 1900 and with its maximum rate has been recently (2000-2008), averaging 145 km3 yr-1 (Konikow, 2011). The arid lands are very vulnerable to groundwater reductions, because the current natural recharge rates are lower than the previous wetter periods (e.g., Atacama Desert and Nubian aquifer system in Africa; Squeo et al., 2006; Mahmod and Watanabe, 2014; Herrera et al., 2018). The main drivers of groundwater depletion in arid lands are their extraction by pumping (medium evidence, high agreement; Mudd, 2000; Jolly et al., 2008; Mays 2013; Mahmod and Watanabe, 2014), climate variability (medium evidence, high agreement; Wang et al. 2002; Wurster et al., 2003; Scalon et al., 2006; Squeo et al., 2006; Woodhouse et al. 2010), and land use change (medium evidence, low agreement; Scalon et al. 2006; Jolly et al., 2008).
7037	12	30	12	31	The reference for the global estimate of pastoralists was published 12 years ago. A more recent publication is desirable and will be more relevant. [Debra Roberts, South Africa]	Accepted, added, Note: the available estimates range between 100 to 200 million, so there is no clear data on this.
23841	12	37	12	37	Kuniyal et al. (2004) Biodiversity and Conservation 13(7): 1271-1304. Here, this reference may further strenghthen the statement as one of the best examples of conflict over traditional versus introduced high yielding varieties of crops in cold desert of the Indian sub-continent. [, India]	Noted, the paper compares traditional crops vs introduced crops hence does not relate to conflicts between pastoralists and crop producers.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
1339	12	12	13	7	In a recent study on global drylands Koutroulis (2019) there are substantial findings for the expansion of drylands and the level of impacted population framed in terms of Global Warming Levels (1.5, 2 and 4oC according to RCP8.5) and the corresponding Socioeconomic Pathways (SSPs) which are more suitable for policy-relevant climate impacts assessments. This study take the opportunity of availability of a new set of higher-resolutions transient climate and impacts simulations that were also supported the findings of the study referenced in the Runoff section of the SR15 and figure 3.15 from the publication (Betts, R.A. et al., 2018). Figure 7 and 14 are highly consistent with the content of this chapter. One relevant highlight (among others) is: - by keeping global warming levels to 1.5 °C, up to 1.9 billion people could avoid living in drylands compared to a 4 °C warmer world of low environmental concern (RCP8.5-SSP3). Koutroulis, A. G. "Dryland changes under different levels of global warming." Science of The Total Environment 2019, 655 (2019): 482-511. doi.org/10.1016/j.scitotenv.2018.11.215 Betts, R.A. et al., 2018: Changes in climate extremes, fresh water availability and vulnerability to food insecurity projected at 1.5°C and 2°C global warming with a higher-resolution global climate model. Philisophical Transactions Royal Society A, 376(2119), doi:http://dx.doi.org/10.1098/rsta.2016.0452. [Aristeidis Koutroulis, Greece]	Noted. We have now referred to this paper in the chapter, e.g. in this Section.
23567	12		13		The topic is mentioned for resilience and vulnerability, but the examples of solutions for building resilience are inadequate. Due to different geographical locations, economic development levels and policy support, there are differences in the performance of vulnerability and resilience. It is recommended that classification should be carried out by region or by agricultural activities. [Huai Jianjun, China]	Rejected. This section is meant to give a very brief overview and introduction to dryland areas, for lists of solutions, please refere to Section 3.7. The chapter does discuss in various locations the vulnerabilities and resilience, desertification extent and solutions by region, and also refrring to different agricultural acivities, providing these here, even in shortened/structured form, would be duplicating a lot of text, and therefore unfeasible.
12669	12	12	14	32	The entire subsection 3.2.3 on the dryland population: Vulnerability and Resilience to Desertification and Climate Change does not cover these aspects for west asia and Arabian Peninsula. [, Saudi Arabia]	Accepted, included.
31971	12	12	14	32	Unlike the climate-change topic, I think the IPBES Assessment does address these in some detail. Maybe a citation should be added. [Stephen Prince, United States of America]	Accepted, included.
28647	12	3		10	World atlas of desertification, for the use of mapping and the process of land degradation in relation to desertification must also use 3D satellites images in-time to be integrated along with mapping of the Arid and Semi Arid regions, (Remote Sensing). [Abiodun Adegoke, Nigeria]	Noted.
3589	12	12			Where is paragraph on Dryland under threat? Vicious cycle... Dryland (arid/semi-arid) is increasingly under pressure due to in-migration, population growth, CC etc. ... this paragraph takes up the issue of actors under pressure... but somewhere/somehow the issue of land under pressure is a bit hidden throughout the whole Chapter.. [Cordula Ott, Switzerland]	Noted, for discussion of drivers of desertification (land under pressure), please refer to section 3.2.4. The discussion on "vicious cycle" and related concepts, please refer to Section 3.2.4.3.
871	12	19		12	To establish how many people are affected by desertification is completely meaningless as long as the definition of desertification remains meaningless (see my comments above). [Tor A. Benjaminsen, Norway]	Noted. Our task is to assess the literature in a balanced manner and there is huge body of literature on desertification. For discussion of the debates surrounding the concepts to which you are alluding, please refer to Section 3.2.4.3.
21923	12	25			3.2.3.Dryland Populations:Vulnerability and resilence to Deserfication and climate Change. Misuse of literature Huang et al., 2016, 2017 [Olusegun Adeaga, Nigeria]	Rejected, both references are relevant to the discussion.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2265	12	29			Please define "pastoral" and "agropastoral" [Nina Hunter, South Africa]	Noted. Please refer to the footnote on the same page.
7041	13	8	12	9	It might be useful to show the actual figures for each region in comparing to the global average. If this is not done, your reader will not understand what is meant by 'increasing population of poverty' [Debra Roberts, South Africa]	Accepted, included.
25165	13	1	13	1	add an "and" to the list, between threats and missunderstanding [Alexander Erlewein, Germany]	Accpted, done.
39021	13	5	13	5	Consider adding discussion of food insecurity: "At present, pastoralists are among the most food-insecure groups in the world. A large number of pastoral households face chronic hunger (State of Food Insecurity 2018), and millions face acute food insecurity (World Food Programme or FEWS NET)." [, United States of America]	Acccepted, the idea is included in paraphrased version.
4139	13	5	13	6	Please, improve the quality/resolution for figure 3.4 [Eugenia Gayo, Chile]	Accepted, done.
39023	13	5	13	6	Color consistency between left and right images leads to easy confusion since dark blue refers to total population in left image and population growth in right image, yet gray represents the same variable (population) in both. [, United States of America]	Accepted, corrected.
1345	13	5	13	7	Figure 3.4: the number of people live in drylands in China is about 105 million and the number of people indirectly affected by desertification in China is about 400 million. [Bo Wu, China]	Noted, however, since no supporting literature is provided we cannot compare these numbers with those reported in Figure 3.4. The figure was redone using IPCC regional classification.
7039	13	5	13	7	The first panel in Figure 3.4 contains current and projected population growth. However, this is not done for the regional panel. Is there a reason for that? Could you please provide an explanation for this? [Debra Roberts, South Africa]	Accepted, done.
3439	13	5	13	7	On the right-hand panel of Figure 3.4 is found the non-uniform size in regional classification, which is suggested to be redone. [, China]	Accepted, done.
12667	13	5	13	7	Figure 3.4 includes different regions namely Japan and Oceania, Southeast Asia, China, South Asia, Russia and Central Asia, Western and Central Europe, Sub-Saharan Africa, Middle East and Northern Africa, Central and South America and North America but missing Arabian Peninsula and West Asia. [, Saudi Arabia]	Accepted, now regions presented according to IPCC classification. Arabian Peninsula and West Asia are included in Asia.
11817	13	5	13	7	Figure 3.4: Please define regions used here, e.g., what is "China region"? Also, where is Australia included? [Hans Poertner and WGII TSU, Germany]	Accepted, done.
39025	13	6	13	6	IMPORTANT: Figure 3.4 may be mislabeled. Does deep blue represent 'expected population' in 2050, or the CHANGE in population between 2010 and 2050? If the latter, then correctly label and add clarifying text to legend. [, United States of America]	Accepted, corrected.
14677	13	11	13	12	This sentence is unclear. Suggest revising. [, Canada]	Accepted, clarified.
39027	13	16	13	16	Use of words 'both' and 'but' is confusing. Change to "Multidimensional poverty incorporates both income-based poverty, and also other dimensions ..." [, United States of America]	Accepted, done.
40569	13		13		Source of information in Figure 3.4, link with SSP? Regions need to be defined more explicitely (IPCC has definitions of regions that differ from those here). [Valerie Masson-Delmotte, France]	Accepted, done. This is under SSP2.
25167	14	1	14	1	add an "and" to the list, between systems and low [Alexander Erlewein, Germany]	Accepted: add and
21771	14	13	14	13	Do "dryland populations" show resilience, or dryland people. Given changes in population size and structures, it is not populations in the demographic sense that show resilience, but rather individuals living within dryland environments. [Graham von Maltitz, South Africa]	Rejected. The phrase is commonly understood and means the peple living in the dryland environments.
25169	14	19	14	19	that limited… sentence structure easy to confuse with a list, consider changing "limiting" into "that limited" [Alexander Erlewein, Germany]	Accepted. Amended accordingly.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
27027	14	23	14	23	In the phrase "testing their adaptive capacities" please replace "testing" with either "challenging" or "threatening", as "testing" could be misunderstood as slightly depreciative depending on the location and linguistic background of the reader. [, Germany]	Accepted. We have replaced "testing" with "challenging."
7043	14	26	14	27	This inference does not seem very helpful as you have not indicated what proportion of the population was already living in poverty before the drought. If a proportion of the population was already in poverty, it is not clear what is meant by stating that their income will fall below the poverty line. [Debra Roberts, South Africa]	Accepted, clarified.
25203	14	27	14	27	"sustainable land management (SLM)" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted.
11821	14	30	14	31	"other SDGs" other which which SDG? [Hans Poertner and WGII TSU, Germany]	Accepted, changed to sustainable development.
25183	14	31	14	31	Sustainable Developement Goals (SDGs) [Alexander Erlewein, Germany]	We have corrected it in the text.
39029	14	37	14	37	Abiotic and biotic processes is confusing jargon. Consider biological and non-biological instead. [, United States of America]	We have changed them in that place.
3785	14	27	16	19	greening up occures in pure deserts when it rains. In the degraded savanna part of Sudan, it becomes green when it rains, but what is green was not described by NDVI users. Grasses grow but the trees (Acacia) never came back. So, it is not true land is recovrring [Mustafa Elhag, Sudan]	That is correct. Limitations of the use of NDVI (and related satelite based vegetation indices) are discussed in section 3.3.1.1
12671	14	34	17	42	Again, all examples and publications quoted in this entire subsection 3.2.4 explains the Processes and Drivers of Desrtification Under Climate Change referring to regions other than West Asia and Arabian Peninsula. [, Saudi Arabia]	Specific reference to West Asia and the Arabian Peninsula, along with references have been added to section 3.2.4.1
64	14	11		12	Confusing. Climate change will impact both water and wind erosion equally. Wind erosion occurs with loss of soil cover, so any disturbance, e.g. drought, will result in reduced cover and increaseds erosion [Julian Dumanski, Canada]	Reject: The use of “low evidence” in the IPCC reports as a confidence statement means that wind erosion studies are fewer and less certain than that water erosion studies. We also note that climate change does not impact water and wind erosion equally. Water erosion is effected by projected increases in rainfall intensities while wind erosion is effected by projected changes in wind extremes which do not change in the same manner.
21925	14	20			3.2.3.Dryland Populations:Vulnerability and resilence to Deserfication and climate Change. Misuse of literature Hussein, 2011 [Olusegun Adeaga, Nigeria]	Rejected, this publication is relevant for the discussion here.
11819	14	26			"following" - is it possible to quantify how long afterwards? [Hans Poertner and WGII TSU, Germany]	Noted, during the same season. But there is no clear time references in the paper. Hence, we parahrased as "income losses due to a drought event will push these households below the poverty line"
2267	14	37			Please define "abiotic and biotic processes" [Nina Hunter, South Africa]	Accepted, changed as biological and non-biological.
3591	15	1	15	7	This sentences could be included under next subchapter (3.2.4.2 anthropogenic drivers...). Although then, the distinction between human-induced and natural is necessarily included here. [Cordula Ott, Switzerland]	Noted, it is better to keep this here to make it clear upfront.
873	15	3	15	3	Lavauden (1927) was actually the first one to use the term 'desertification' in a publication (see Diana Davis 2016, The Arid lands: History, Power, Knowledge; this is by the way an important book on the history of desertification that the chapte should refer to) [Tor A. Benjaminsen, Norway]	Accepted, included.
25171	15	4	15	4	view on [Alexander Erlewein, Germany]	Accepted. 'of' changed to 'on'.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8961	15	5	15	6	"By definition, processes and drivers of desertification are similar to the processes and drivers of land degradation". I suggest to replace "similar" with "close", or to reflect that the processes of desertification are only the part of the LD processes although some of them are very specific to drylands [Jean-Luc Chotte, France]	Accepted. 'similar' changed to 'close'.
31973	15	8	15	8	Replace "or through" with "often caused by" [Stephen Prince, United States of America]	Accepted. 'or through' replaced with 'often caused by'
41525	15	9	15	10	Please revise according the main conclusions of IPCC AR V related with the precipitations projections in the future the [Cristobal Felix Diaz Morejon, Cuba]	Accepted. Thank you for your suggestion. Based on mulitple comments the word "particularly" is added to emphasise that this is just one example. Otherwise the statement is in-line with the conclusion in IPCC AR5
39031	15	9	15	11	This could be improved. The volume of water for drylands is not necessarily expected to increase, but precipitation extremes are. Perhaps use instead: "As the atmosphere warms, it is expected to increase evaporation on dry days, while also holding more water on rainy days. This is expected to substantially increase the intensity of extreme precipitation events, potentially enhancing erosion." [, United States of America]	Accepted. Thank you for your suggestion. Based on mulitple comments the word "particularly" is added to emphasise that this is just one example.
6683	15	9	15	11	It's perfectly true. However, erosion does not depend only on precipitation volumes and intensity. The shift of rain events in dryland areas during the year may cause severe effects on erosion. For example, the increase of temperature and decrease of precipitation over 40-years, accompanied with a shift towards an earlier onset of first rains during summer, was found with cascading effects on hydrology and vegetation that induced to almost double the sediment flux every decade from the 1970s to the 2000s in a semiarid basin of Western Algeria (Achite M. and Ouillon S., 2016. Recent changes in climate, hydrology and sediment load in the Wadi Abd, Algeria (1970-2010). Hydrology and Earth System Sciences, 20, 1355-1372, doi:10.5194/hess-20-1355-2016). The increase in rainfall variability also increases sediment fluxes in rivers, even in the case of decreasing rainfall such as in the upper Tafna basin, in Algeria (Megnounif A. and Ouillon S., 2018. Empirical and analytical methods to characterize the efficiency of floods to move sediment in a small semi-arid basin, Hydrology & Earth Science Systems, 22(12), 6335-6355, doi: 10.5194/hess-22-6335-2018). [Sylvain Ouillon, France]	Noted. Yes, many other aspects are involved in causing water erosion. Here the concept is introduced and the first order climate change (increases in precipitation volume and intensity) is mentioned. This is not intended to provide a comprehensive list of all possible causes of water erosion. The word "particularly" is added to emphasise that this is just one example.
8963	15	11	15	12	"On the other hand, there is low evidence concerning climate change impacts on wind erosion (Cross-Chapter Table 4.1 in Chapter 4; Section 3.8.1)." This is a very strange and confusing statement. Probably the authors consider the direct impact of the increasing temperature on that, but in case of desertification the mechanism is more complicated, e.g. through the impact on the productivity and overgrazing effect". See also the section 3.4.1 in the same Chapter, which contains the opposite viewpoint [Jean-Luc Chotte, France]	Rejected. Here we are considering published studies that investigated future changes in wind erosion/dust emission. Section 3.4.1 presents the mechanisms by which desertification can feedback on the climate. One way is through causing dust emission. Section 3.4.1 does not address future projections at all. These two sections are in accord with each other.
26577	15	11	15	12	You should mention the ewxistence of anthropogenic dust (Ginoux et al., 2012). Citation: Ginoux, P., J. M. Prospero, T. E. Gill, N. C. Hsu, and M. Zhao (2012), Global-scale attribution of anthropogenic and natural dust sources and their emission rates based on MODIS Deep Blue aerosol products, Rev. Geophys., 50, RG3005, doi:10.1029/2012RG000388. [Yves Balkanski, France]	Accepted. Anthropogenic sources are mentioned and this reference is now added.
8251	15	13	15	21	Please assess the projected climate change impacts on salination, soil carbon and other indicators of desertification. [Noureddine Yassaa, Algeria]	Accepted, we have include more information on these aspects.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
27029	15	19	15	20	This is an important point and the statement seems intuitive that desertification leads to soil carbon loss and emissions to the atmosphere. Certainly there must be more evidence than just one study. Please strengthen this statement either with further sources or by clarifying that Lal (2009) is a large meta-study (if that is the case), as the statement reflects a fundamental concept for linking climate mitigation and other goals in sustainable land use. [, Germany]	Accepted: this explain better in the section 3.5.1.1 and we add the cross section reference in this paragraph
25173	15	19	15	21	either introduce soil organic carbon (SOC), too, or consider not introducing soil carbon (C), as it is only used once after. [Alexander Erlewein, Germany]	Accepted, abbriviation dropped.
24743	15	19	15	21	as it is declared to be a consequence, it should not be listed/included with the drivers [Annalisa Cherchi, Italy]	Accepted, paraphrased.
23471	15	19	15	21	It would help to briefly (e.g., one sentence) describe the key mechanisms by which global warming might accelerate SOC turnover, including accelerated soil erosion. [Nicholas Webb, United States of America]	Accepted: we add the following sentences: since the decomposition of the soil organic matter by microbial activity begins with low soil water availability, but this moisture is insufficient for plant productivity (Austin et al., 2004; section 3.5.1.1) as well as losses by soil erosion (Lal, 2009); therefore,
24745	15	22	15	33	the paragraph should be re-ordered: (i) identification of SST as a possible driver; (ii) provision of robust example of what happened for Sahel from different sources of analysis [Annalisa Cherchi, Italy]	Accepted. An introductory sentence indentifying SST as a possible driver has been added.
31741	15	22	15	33	This part is only devoted to climate drivers for particular region(Sahel) ;it would be better to add other climate drivers of drought/desertification that influence different parts of the globe. [WAFAE BADI, Morocco]	Accepted, information added from more diverse range of regions.
26579	15	22	15	33	You should i indicate that during the Last Glacial Maximum, dust fluxes were 2 to 30 times more intense than they are at present (Petit et al., 1990; Mahowald et al., 1999). Citations: Petit, J. R., L. Mounier, J. Jouzel, Y. , S. Korotkevich, V. I. Kotyakov, and C. Lorius, Paleo-climatological and chronological implications of the Vostok core dust record, Nature, 343, 56-58, 1990. Mahowald, N., Kohfeld, K., Hansson, M., Balkanski, Y., Harrison, S. P., Prentice, I. C., Schulz, M., and Rodhe, H.: Dust sources and deposition during the last glacial maximum and current climate: A comparison of model results with paleodata from ice cores and marine sediments, J. Geophys. Res.-Atmos., 104(D13), 15895–15916, 1999. [Yves Balkanski, France]	Noted. Thank you for the information. Here we are discussing teh affect of the SST anomalie - not the cause of it.
39033	15	23	15	24	The latest research by Gianni and Pomposi shows a weakening of this teleconnection. [, United States of America]	Noted.
41505	15	32	15	32	Please check coherency for explanation of changes in Sahel drought with SR15. Authors of WGI AR6 chapter 3 may be relevant to ensure coherency too. Note that aerosols may affect SST too. [Valerie Masson-Delmotte, France]	Noted. We could not find an explanation for changes in Sahel drought in SR15. We note that aerosols may affect SST and this is discussed in section 3.4.1.1
39035	15	33	15	33	Consider adding "For eastern East Africa, both recent droughts and decadal declines have been linked to human-induced warming in the western Pacific (Funk et al. 2018)." REF: Quarterly J. Royal Met Soc., Funk et al. (2018) BAMS. [, United States of America]	Acepted: the sentence was added
11827	15	34	15	41	These issues are not clear in the Executive Summary [Hans Poertner and WGII TSU, Germany]	Noted, added on invasives in the ES.
27031	15	35	15	36	The correlation between plant encroachment and altered run off and soil erosion is not clear in this context. Please give some more explanation. [, Germany]	Accepted, we add the following sentences with references: Extensive woody plant encroachment altered runoff and soil erosion, because the bare soil between shrubs are very susceptibility to water erosion, mainly in high-intensity rainfall events (Manjoro et al., 2012; Pierson et al., 2013; Eldrige et al. 2015).
5757	15	35	15	37	reference for these lines [Sanaz Moghim, Iran]	Accepted: we add the following references: (Manjoro et al., 2012; Pierson et al., 2013; Eldridge et al. 2015)

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25175	15	37	15	41	"of [the] ecosystems" (doubling); Doubling of biodiversity loss, cut the first one, line 39: "…and invasive confiers [resulting in loss of biodiversity]. This land cover conversion has resulted in desertification and reductions in forage availability, wildlife habitat, and biodiversity." [Alexander Erlewein, Germany]	Accepted, done.
24747	15	42	15	44	not clear: are fires identified as drivers of desertification? How? (if that is the case this paragraph should be organized as the others before [Annalisa Cherchi, Italy]	Accepted we add the following sentence: The wildfire is a driver of desertification, because reduce vegetation cover, increase runoff and soil erosion, reduce soil fertility and affect the soil microbial community (Vega et al., 2005; Nyman et al., 2010; Holden et al., 2013; Pourreza et al., 2014; Weber et al., 2014; Lui and Wimberly, 2016)
11823	15	7			Do you mean table 4.1 in chapter 4? it is not called a cross-chapter table there so should not be called so here, either, otherwise the reader can get confused [Hans Poertner and WGII TSU, Germany]	Accepted, it will be called as Cross-chapter box in Chapter 4.
11825	15	11			"limited evidence", not "low evidence" [Hans Poertner and WGII TSU, Germany]	Accepted, corrected.
2269	15	13			Please define "saline and sodic soils" [Nina Hunter, South Africa]	Accepted, reference to glossary included.
86	15	35		36	Confusing. Out migration is a common strategy when population pressures exceed biological resources [Julian Dumanski, Canada]	Rejected, migration is not only shaped by push factors, lack of biological resources being just one example among many for "push" factors, but also by numeorus "pull" factors (e.g. desire to earn more money in urban area)
23473	16	2	16	2	Bond et al 2003 missing from references, suggest adding reference to Balch, J.K., Bradley, B.A., D'antonio, C.M., Comez-Dans, J., 2013. Introduced annual grass increases regional fire activity across the arid western USA (1980-2009). Global Change Biology, 19: 173-183. [Nicholas Webb, United States of America]	Accepted, suggested reference added. We checked on Bond et al 2003, it is in fact in the reference list.
39037	16	11	16	11	This super important point could be expanded briefly. What is meant by consumption? What is being consumed? [, United States of America]	Noted. IPBES (2018) speaks of consumption of land-based resources. Included.
41507	16	12	16	12	explain the links between growing consumption and land degradation. [Valerie Masson-Delmotte, France]	Accepted, clarified.
3583	16	16	16	17	invasive species often results out of human activities... Shouldn't this be included to anthropogenic drivers? [Cordula Ott, Switzerland]	Noted. Here we discuss from the climate change impact on invasives species perspective.
8143	16	16	16	17	"Some of the major forms of desertification are related to land conversions, including transformation of rangelands and woodlands into croplands". It is confusing, are these part of desertification or land degradation? [Haruni Krisnawati, Indonesia]	Noted, please refere to the definition of desertification (Glossary and Section 3.2.1), which is land degradation in drylands.
32263	16	16	16	17	Should specify what the forms of desertification are-cropland conversion is not desertication unless it is unsustainable. [Nicholas Webb, United States of America]	Noted, sentence changed to make it more clear.
31975	16	16	16	17	Whether land cover conversion (say, forest to crops) is "degradation" is different from the point of view of a climatologist and human welfare. To say all cropland is degraded is not very useful. While the initial conversion could be regarded as degradation, once established, the cultivated or pastoral land enters a different category. Of course farmland can be degraded, but relative to its land use, not primeval vegetation. [Stephen Prince, United States of America]	Noted. Cropland expansion has been consistently named as one of the major drivers of land degradation (e.g. IPBES 2018), here this paragraph reflects this robust evidence and high agreement in the literature.
21773	16	16	16	26	This seems to confuse 2 issues, land transformation to agriculture as a form of degradation, and loss of agricultural productivity as a consequence of degradation (or climate change). [Graham von Maltitz, South Africa]	Noted, both were meant. Clarified.
25205	16	31	16	31	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, corrected.
24749	16	31	16	31	how is "substainable land management" defined? Is it in the Glossary? [Annalisa Cherchi, Italy]	Accepted, yes, SLM is defined in the Glossary. reference to glossary included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25391	16	37	16	43	This paragraph is not clear enough and barely understandable. We suggest to clarify it. [, France]	Accepted, clarified further.
25207	16	38	16	38	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, corrected.
25177	16	43	16	43	add space after areas "areas(Taylor et al., 2016;…)" [Alexander Erlewein, Germany]	Accepted, corrected.
8715	16	4	17	1	The desertification is a sum of processes that are having impact on many areas and is depending on the specificities of national lanscape. The debate around the climate change, loss of soil productivity, migration has to be seen from a multi-perspective in relation with affected communities, including the aspects related to access to natural resources from a gender perspective. [Mihaela Stefanescu, Romania]	Accepted, Sections 3.5.2, 3.7.2, 3.7.3 cover these dimensions.
21927	16	4	17	11	3.2.4.2. Anthropogenic Drivers of Desertification under Climate Change. Discuss what are the various anthropogenic drivers for desertification under climate change with evidential data. [Olusegun Adeaga, Nigeria]	Accepted, more evidence is provided. There is not much empirical evidence on how climate change is affecting many of the drivers of desertification.
3585	16	35	17	2	It is important to also discuss in-migration. Where do migrant go to? Pressure on semi-arid areas is high in the South! issues to consider: Competition on land, agricultural techniques not adapted to local environment; conflicts, degradation and desertification.... [Cordula Ott, Switzerland]	Accepted, in-migration discussed in Section 3.7.2.6., agricultural technologies are discussed in Section 3.7.1, conflicts in Section 3.5.2. The literature on people migrating TO dryland areas and such in-migration resulting in desertification could not be found.
39039	17	1	17	1	Here and elsewhere in the chapter 'is context-dependent' really means 'depends on the specific location being examined'. Consider the latter which is easier to understand. [, United States of America]	Accepted, changed to "varies from place to place"
3823	17	4	17	8	considering what is said on page 3-16 lines 11-12 (IPBES also found … population growth), should not "high and growing consumption escalated by population growth" occupy the first rank in this list? [Philippe Waldteufel, France]	Noted, this sentence already puts the emphasis on population growth. No change.
8253	17	13	17	13	Please elaborate natural variability influence and natural vs anthropogenic influences. [Noureddine Yassaa, Algeria]	Accepted, Separating out these effects is very complex, this is discussed in detail in 3.3.2. on attribution.
11697	17	13	17	15	Desertification "Syndrome" is used in the subsection title, but "paradigm" is used on line 15, which is confusing as "paradigm" is used with "development" in the title. Suggest changing "paradigm" to "syndrome" on line 15. [Paul Dirmeyer, United States of America]	Accepted, done.
24751	17	15	17	15	"vicious cycle" could be changed with "feedback" [Annalisa Cherchi, Italy]	Rejected, "vicious cycle" is the widely accepted term used in many studies in this topic.
25209	17	18	17	18	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, done.
32265	17	21	17	21	Strike "is a nonequilibrium system"--many drylands are not, but climate is still variable. [Nicholas Webb, United States of America]	Accepted.
8965	17	21	17	29	"non-equilibrium nature of drylands" is again a very confusing concept. This should be clarified: which drylands are considered as having the "non-equilibrium nature"? All of them? This statement is very disputable! Natural deserts or oases are very sustainable ecosystems within the limits of possible impact! [Jean-Luc Chotte, France]	Accepted, following this and other comments reference to non-equilibrium dropped. This description was also not essential for the points being made.
24753	17	22	17	22	"high termporal climatic variability" should be better expalined. What kind of higher frequency is it referred to? [Annalisa Cherchi, Italy]	This is a temporal variability that precipitation is typically more-or-less unpredictable due to year-to-year and seasonal variability.
5759	17	25	17	27	can we say " desertification as irreversible degradation" irreversible! [Sanaz Moghim, Iran]	Rejected, desertification does not necessarily mean irreversible degradation
3787	17	30	17	31	soil degradation is only part of land degradation [Mustafa Elhag, Sudan]	Rejected, this comment is not related to the referred page and lines.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39041	17	31	17	32	Revise as follows: "As discussed in 3.3.2, it is not clear whether human or climate factors are the most influential on desertification." [, United States of America]	Accepted, the sentence simplified.
39043	17	34	17	42	This section is totally opaque. There are a huge number of unnecessary and undefined terms, and the reader never learns what things go together to typically produce desertification. Can it be cut? Seems like a lot of technical discussion and citations saying it is very hard to say anything. [, United States of America]	Accepted, deleted. We kept the citations so that interested readers could look up these sources discussing on typical patterns approaches.
7045	17	35	17	35	What is the typical pattern? [Debra Roberts, South Africa]	Noted, this section was deleted responding to other comments.
23475	17	39	17	40	Suggest adding reference to Bestelmeyer BT, Peters DPC, Archer SR, Browning DM, Okin GS, Sala OE, Schooley RL, Webb NP, 2018. The grassland-shrubland regime shift in the southwestern United States: misconceptions and their implications for management. Biosciences. Vol. 68, 678-60. [Nicholas Webb, United States of America]	Accepted, added.
21929	17	13		42	3.2.4.3. Interraction of Drivers:Desertification Syndrome versus Drylands Development Paradigm. Show proof with global data record [Olusegun Adeaga, Nigeria]	Noted, the related conceptual papers are listed in this section. The empirical evidence is presented in Section 3.3.
3593	17	13			This is a very important and nice paragraph. But, I miss a bit the idea that Dryland/Desertification is an interface with contiguously shifting boarders (naturally); This marginal area is used by people that have to shift and move and adapt contiguously, too. [Cordula Ott, Switzerland]	Noted, discussion about migratory practices is given in Sections 3.2.3. and 3.5.2..10 on pastoral populations.
27033	17	21			Please explain why dryland are "non-equilibrium systems". [, Germany]	Noted, following other comments, references to non-equilibrium was dropped.
39045	18	1	18	1	What about increased UV radiation and increased number of cloud free days? [, United States of America]	Noted. Unfortunately, we could not understand what comment is referring to.
39047	18	2	18	14	There is some serious cognitive dissonance in the 'Desertification Trends' section. So far the report has been very careful about treating desertification as a subset of land degradation. Well done. But now authors opt to look at shifts in climate? Changes in aridity do not equate desertification. Would suggest rewriting the introduction along the lines of "While past studies have used the Aridity Index to examine changes in desertification, this approach has several key limitations: (i) the AI does not measure land degradation, (ii) the impact of changes in climate on the land surface and systems is complex, and (iii) the relationship between climate change and changes in vegetation is complex due to the potential influence of CO2 ..." Drop redefining the AI categories. Already done but not necessary anyway. [, United States of America]	Noted.
7047	18	3	18	14	The order in which the text in this paragraph is presented is very confusing. Please consider revising according to the following: After the reference in line 5, insert 'dryland expansion is used as measure/proxy of desertification. However, the expansion of the drylands does not imply desertification by itself, if there is no long-term loss of the biological productivity of drylands, their ecological complexity, and/or their human values'. This can then be followed with the text on the measurement of dryland [Debra Roberts, South Africa]	Text changed to "While past studies have used the AI to examine changes in desertification or extent of the drylands (Feng and Fu, 2013; Asadi Zarch et al., 2015; Ji et al., 2015; Spinoni et al., 2015; Huang et al., 2016), this approach has several key limitations: (i) the AI does not measure land degradation, (ii) the impact of changes in climate on the land surface and systems is complex, and (iii) the relationship between climate change and changes in vegetation is complex due to the influence of CO2. Expansion of the drylands does not imply desertification by itself, if there is no long-term loss of the biological productivity of drylands, their ecological complexity, and/or their human values."
875	18	4	18	5	Quantifying desertification is not only difficult bcause of the multiplicity and complexity of processes, but also because of the lack of clarity inherent in the concept itself and the difficulties in defining desertification. [Tor A. Benjaminsen, Norway]	Noted. This is true, however the definition of desertification - as used in this report - is given in section 3.2.1

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25179	18	5	18	9	The AI is introduced before (p. 8, l. 14); the AI thresholds for dryland climate classes are given at p. 8, l. 24-25 [Alexander Erlewein, Germany]	Information removed.
24755	18	5	18	9	these information are present also in previous sections (also details in Fig3.1). Not sure there is need to repeat it again here [Annalisa Cherchi, Italy]	Information removed.
41527	18	5	18	29	The aspects of Aridity Index (AI) are repeated of page 8 Figure 3.1 and lines from 14-21, point 3.3.1. Status and Trends [Cristobal Felix Diaz Morejon, Cuba]	Information removed.
41747	18	7	18	7	The section mentions later the concerns that have been highlighted in the literature regarding the suitabiltiy of AI as a measure of water limitation. This should be already highlighted here. E.g. "The use of AI as a measure of aridity has been questioned in the literature (Donohue et al. 2013; Roderick et al.2015; Greve et al. 2017). [Sonia Seneviratne, Switzerland]	Sentence has been changed to "While past studies have used the AI to examine changes in desertification or extent of the drylands (Feng and Fu, 2013; Asadi Zarch et al., 2015; Ji et al., 2015; Spinoni et al., 2015; Huang et al., 2016), this approach has several key limitations: (i) the AI does not measure land degradation, (ii) the impact of changes in climate on the land surface and systems is complex, and (iii) the relationship between climate change and changes in vegetation is complex due to the influence of CO2."
19015	18	9	18	12	Additional reference may be cited: Ramarao et al. (2018) assessed that the observed aridity index (AI) decreased over the semi-arid regions in India during 1951 to 2005 period. This study further revealed a 10% expansion in the area of these semi-arid regions during recent decades relative to previous decades (Ramarao, M.V.S., Sanjay, J., Krishnan, R., Mujumdar, M., Bazaz, A., Revi, A., 2018, On observed aridity changes over the semiarid regions of India in a warming climate. Theor Appl Climatol, https://doi.org/10.1007/s00704-018-2513-6) [Sanjay Jayanarayanan, India]	Reference included
8967	18	16	18	18	I dislike the picture with a mask for non drylands. What is the reason for that? One cannot compare the state with NDVI dynamics in Drylands and non-drylands! It would be better to give the border between drylands and non-drylands. The same concerns to other similar pictures [Jean-Luc Chotte, France]	Chapter 4 deals with non-drylands. The mask helps ensure that this chapter remains focused on desertification.
39049	18	18	18	18	Shouldn't these trends be screened for significance? Also, why go beyond 70N and 60S? Can't this map be shown using a projection? [, United States of America]	Accepted, the map resolution improved. The trend was calculated using the Theil-Sen estimator which is a median based estimator, and is robust to outliers.
25181	18	19	18	27	similar discussion as on page 9, line 4-12 [Alexander Erlewein, Germany]	The discussion here has been moved and merged with that on page 9.
40573	18		18		We also need the AI trend as done for NDVI. Check coherency with chapter 2 on global / regional greening / browning (and maybe also chapter 6 on anthromes). [Valerie Masson-Delmotte, France]	Rejected, one of our key messages is that aridity index is a poor proxy for delineating drylands under the increasing CO2 environment. Moroever, being a dryland does not automatically mean desertification. Hence, trends in the aridity index do not have as much relevance for desertification especially under climate change.
22549	18	3	19	29	Use of aridity index to define changing aridity levels and dryland extent in an environment with changing atmospheric CO2 - needs revisiting. Increasing CO2 means increasing temperatures - thus increasing evapotranspiration. [Anastasios Kentarchos, Belgium]	Rejected. This may be true for evaporation from bare soils but it is not true for transpiration as the vegetation change their behaviour under increased CO2. No change made.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39051	18	27	19	1	On page 17, line 28, the report states: "This issue at least partially explains the apparent contradiction between the drylands becoming more arid according to the AI and also becoming greener according to satellite observations (Fensholt et al. 2012; Figure 3.5)." An additional contradiction problem with using Figures 3.5, 3.6, and 3.7 is that these maps are based on the trend in GIMMS NDVI3g, which has been shown to give false greening patterns, particularly at high latitudes, per the findings from Pattison et al. (2015, Trends in NDVI and tundra community composition for in the Arctic National Wildlife Refuge, Alaska from 1988 to 2009. Ecosystems, 18: 707-719). GIMMS NDVI trend analysis may be flawed, and it is not clear why other citations to regional MODIS NDVI trends analysis have been comparatively overlooked in this chapter. [, United States of America]	Accepted, reference added in section 3.3.1.1 where limitations of using NDVI are discussed
12673	18	1	30	8	The entire section 3.3 does not discuss the whole west asia and arabian peninsula. [, Saudi Arabia]	Accepted, included.
32037	18	1	30	8	Throughout this entire section, techniques are scattered among results of specific studies. It would be better together them all into one place, then move on to results. [Stephen Prince, United States of America]	Noted. In this section studies using each of the main techniques (expert judgement, remote sensing and biophysical models) have been grouped together.
11829	18	1	30	9	Section 3.3 (including subsections) is completely lacking in statements of confidence, likelihood & agreement (IPCC calibrated language). [Hans Poertner and WGII TSU, Germany]	Noted. Confidence langauge added on the key messages from that section.
39053	19	1	19	1	A sentence should be added defininig NDVI and describing Figure 3.5. Or wait until later to call out the figure (i.e., move after Figure 3.6 then discuss). [, United States of America]	Accepted, figure moved to section 3.3.1.1
39055	19	1	19	1	It is not clear that the annual max NDVI is a sufficient metric to quantify veg/water availability either. For example, peak NDVI might increase, but longer lower periods between peaks could lead to pasture stress. The link between CO2 fertilization and crop production is complex, not well understood, and crop-dependent. [, United States of America]	Noted. No mention of annual max NDVI here. It is used in Figure 3.6 to indicate the variation in vegetation cover/density/primary production across the drylands. CO2 fertilization effect on crop production is discussed in Chapter 5.
25239	19	3	19	3	aridity index -> AI, if abbreviation is introduced on page 8, line 14 [Alexander Erlewein, Germany]	Accepted.
31977	19	6	19	6	Should this be three (not four)? [Stephen Prince, United States of America]	Accepted, fixed.
11831	19	6	19	8	"four approaches" - only three approaches listed here [Hans Poertner and WGII TSU, Germany]	Accepted, fixed.
21775	19	6	19	10	Only 3, not 4 methods are listed. [Graham von Maltitz, South Africa]	Accepted, fixed.
25057	19	6	19	10	I only found 3 approaches, not 4: (1) expert judgement (2) satellite observation (3) use of biophysical models. Please clarify. [Junguo Liu, China]	Accepted, fixed.
23229	19	6	19	10	Only three methods are presented. [Kaoru Tachiiri, Japan]	Accepted, fixed.
877	19	14	19	15	Desertification is primarily difficult to map because of an unclear definition. It is not only difficult to map at a global scale, but also at a local and regional scale. [Tor A. Benjaminsen, Norway]	Noted, we highlight this diffiuculty in several locations in the chapter. At the same time, there is huge body of literature measuring various specific elements of desertification both globally and locally. This literature cannot be ignored in any balanced assessment.
39057	19	16	19	16	Why is 'Expert judgement' in bold? [, United States of America]	Noted. In this section the studies are grouped by their methodological approach. Each approach is in bold to highlight each grouping.
2271	19	18	19	20	This chapter is on degradation of drylands but this section refers to degradation as a whole - should this reference not be removed? [Nina Hunter, South Africa]	Noted. These global approaches included the drylands, and where possible dryland specific information is given.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32111	19	19	19	20	On GLASOD, see quantitative reviews in: - Sonneveld, B. G., & Dent, D. L. (2009). How good is GLASOD? Journal of Environmental Management, 90(1), 274–283. https://doi.org/10.1016/j.jenvman.2007.09.008 - Prince, S. D. (2016). Where does desertification occur? Mapping dryland degradation at regional to global scales. In R. H. Behnke & M. Mortimore (Eds.), The end of desertification? (pp. 225–263). Heidelberg: Springer Earth System Science. https://doi.org/10.1007/978-3-642-16014-1_9 [Stephen Prince, United States of America]	Accepted. References added. Prince 2016 reference added to previous paragraph as it is more appropriate there.
31979	19	26	19	26	Add at end of paragraph, "However, there is as yet no rigorous global or even regional-scale map of the extent or severity of desertification." [Stephen Prince, United States of America]	This point is made at the end of this section (3.3.1.1)
39059	19	27	19	27	Why is 'satellite-based remote sensing' in bold? [, United States of America]	Noted. In this section the studies are grouped by their methodological approach. Each approach is in bold to highlight each grouping.
8633	19	27	19	39	Excellent point, it is very important to mention advances in Remote Sensing related to the topic. [Vincenza Ferrara, Italy]	Noted.
23231	19	29	19	29	"course" means coarse? "up to 25km" is for composite data? We can use MODIS data (of 250m spatial resolution) or AVHRR data (1.1 km). [Kaoru Tachiiri, Japan]	Accepted.
31981	19	29	19	29	"course" mis-spelled. replace with"...relatively coarse (up to 64 km2) and ..." [Stephen Prince, United States of America]	Accepted.
31983	19	29	19	29	What sensor is 25km? And do you mean 25 x 25 km? The GIMMSg AVHRR data are the coarsest frequently-used data and they are often quoted as 8 x 8km (although for several reasons, 24 x 24km is more accurate). [Stephen Prince, United States of America]	Microwave based data is ~25km. It is discussed later in this section.
25195	19	31	19	31	NDVI, if abbreviation is introduced on p. 10, l. 31 [Alexander Erlewein, Germany]	Accepted.
11833	20	1	20	3	"Non-dryland regions (Aridity Index > 0.65) are masked in grey" plese adjust the scale bar colour [Hans Poertner and WGII TSU, Germany]	Rejected. The colour bar does not show aridity Index.
31985	20	5	20	6	Maybe cite the original work on this, which has several points that have been missed by subsequent work. Prince, S. D., De Colstoun, E. B., & Kravitz, L. L. (1998). Evidence from rain-use efficiencies does not indicate extensive Sahelian desertification. Global Change Biology, 4(4), 359–374. https://doi.org/10.1046/j.1365-2486.1998.00158. [Stephen Prince, United States of America]	Noted. Thank you, however the point here is made sufficiently with the more recent references. No change made.
5761	20	7	20	8	NDVI can be increased by agriculture expansion, good to mention it! [Sanaz Moghim, Iran]	Noted. Yes it can, many factors can influence the NDVI values. Here we are only refer to the strong influence of preciptiation on NDVI values in the drylands. No change made.
31991	20	10	20	11	Replace with "...Other factors, including temperature, specific humidity and atmospheric CO2 concentration have been shown to dominate NDVI trends in some regions (Rishmawi et al 2016) ..." Rishmawi, K., & Prince, S. D. (2016). Environmental and anthropogenic degradation of vegetation in the Sahel from 1982 to 2006. Remote Sensing, 8(11). https://doi.org/10.3390/rs8110948 [Stephen Prince, United States of America]	Rejected. Temperature is correlated with CO2 concentration and was not tested in Rishmawi & Prince (2016). The finding of temperature as a factor may not be true once CO2 effects are accounted for. Regardless the current text does not exclude such a possibility. No change made.
31987	20	28	20	28	Replace "Each of these datasets..." with "Some other vegetation indices have been devised to overcome..." [Stephen Prince, United States of America]	Accepted. "datasets" has been changed to "indices"

Comment No	From Page	From Line	To Page	To Line	Comment	Response
31989	20	29	20	30	I thought Huete developd EVI to deal with the opposite problem, that is soil reflectance in sparse vegetation. Also, beware the common misunderstanding of the meaning of NDVI and its "saturation". What is saturated is the absorption of PAR. [Stephen Prince, United States of America]	Rejected. Huete developed the SAVI (soil adjusted vegetation index) not the EVI. No physical causes for the NDVI saturation are postulated, it is merely presented as a known characteristic of the NDVI signal. No change made.
39061	21	9	21	9	Provide a clear definition for vegetation dynamics since this has different interpretations based on which community uses this term. [, United States of America]	Accepted. "dynamics" changed to "changes"
2273	21	21	21	22	Is this case study in a dryland area? Does it fit the definition of desertification? [Nina Hunter, South Africa]	Noted. Yes. The majority of the Awash basin is dryland.
31993	21	26	21	26	Replace "evolution" with "phenology" [Stephen Prince, United States of America]	Accepted.
23477	21	27	21	27	Suggest adding reference to Browning, D.M., Maynard, J.J., Karl, J.W., Peters, D.P.C., 2017. Breaks in MODIS time series portend vegetation change: verification using long-term data in an arid grassland ecosystem. Ecological Applications, 27: 1677-1693. [Nicholas Webb, United States of America]	Accepted. Reference added to section 3.3.2. "Browning et al. (2017) have shown that break points in NDVI time series reflect vegetation changes based on long-term field sites."
39063	21	31	21	31	Which biophysical models are used? This is important since each comes with various assumptions and limitations. [, United States of America]	Accepted. Text added "All biophysical models have their own set of assumptions and limitations that contribute to their overall uncertainty, including: concerning model structure; spatial scale; data requirements (with associated errors); spatial heterogeneities of socioeconomic conditions; and agricultural technologies used."
27035	21	31	21	33	The overall factors of uncertainty should be mentioned with respect to biophysical model simulations including references. [, Germany]	Accepted. Text added "All biophysical models have their own set of assumptions and limitations that contribute to their overall uncertainty, including: concerning model structure; spatial scale; data requirements (with associated errors); spatial heterogeneities of socioeconomic conditions; and agricultural technologies used."
39065	21	39	21	40	What about uncertanties from basic model structure? [, United States of America]	Accepted. Text added "All biophysical models have their own set of assumptions and limitations that contribute to their overall uncertainty, including: concerning model structure; spatial scale; data requirements (with associated errors); spatial heterogeneities of socioeconomic conditions; and agricultural technologies used."
31995	21	40	21	40	"..data limitations, especially geographic scale,..." [Stephen Prince, United States of America]	text added "All biophysical models have their own set of assumptions and limitations that contribute to their overall uncertainty, including: concerning model structure; spatial scale; data requirements (with associated errors); spatial heterogeneities of socioeconomic conditions; and agricultural technologies used."
39067	21	41	21	41	The Land Productivity Dynamics data set needs to be cited and described. It is not at all clear what it is. [, United States of America]	citation added
31997	21	41	21	42	Need to cite the sources of LPD data [Stephen Prince, United States of America]	citation added
8969	21	42	22	3	The time period from 1997 to 2013 is a bit old. It is better to use newest data recieved by the ESA and UNCCD also [Jean-Luc Chotte, France]	Noted. That is the time period covered by this product and discussed in this literature
1347	22	2	22	2	global change issues (GCIs)should be included in Glossary. [Bo Wu, China]	The section removed
39069	22	2	22	2	What does a GCI represent? Authors need to provide a clear description, example, and definition. [, United States of America]	The section removed
31999	22	2	22	9	Is the meaning and validity of GCIs dealt with somewhere? If so, give section #. [Stephen Prince, United States of America]	The section removed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3825	22	3	22	9	It is suggested to add at the end of the paragraph: "For every case and region, population density is seen to rank first among the Global Change Issues". [Philippe Waldteufel, France]	The section removed
32003	22	10	22	13	Modeling has a potentially critical role since it may be able to detect the non-degraded condition with which to compare the satellite RS observations. This is a baseline issue that is not mentioned so far [Stephen Prince, United States of America]	Noted. Desertification is a process not a state. The primary question is not "is the land degraded?" for which you need a clear non-degraded baseline, the question is "is the land (in drylands) degrading?". This question can be asked from any baseline. Nevertheless, text has been added ".... remotely sensed data, ground observations and new modelling approaches."
25185	22	13	22	13	SDGs, if abbreviation is introduced on page 14, line 31 [Alexander Erlewein, Germany]	Noted.
2035	22	13	22	13	If the authors see fit, they could also mention the potential of using reanalyses (obtained by combination of observational and model information using data assimilation) of the land surface for monitoring desertification and/or other aspects of the land surface. [William Lahoz, Norway]	Accepted. We have added a reference to new modelling approaches. ".... remotely sensed data, ground observations and new modelling approaches."
32113	22	15	22	20	The comment on pp 1 -85 on results are cited without indication of the methods used applies particularly to this section (3.3.1.2). [Stephen Prince, United States of America]	Noted. Such a wide variety of methodologies are used in these regional/local studies that details on all of them cannot be included. Text has been added to clarify this "These regional/local studies use a wide variety of methodologies, making direct comparison difficult. Here we discuss the findings of studies relevant for each UNCCD annex region. For details of the methodologies refer to the individual papers."
8255	22	20	22	20	Common definition of regions across chapter can help consistency. [Noureddine Yassaa, Algeria]	Noted. Arranged regions to based on WMO zoning
32121	22	22	22	22	Why are Zimbabwe and South Africa omitted? Prince, S. D., Becker-Reshef, I., & Rishmawi, K. (2009). Detection and mapping of long-term land degradation using local net production scaling: Application to Zimbabwe. Remote Sensing of Environment, 113(5), 1046–1057. https://doi.org/10.1016/j.rse.2009.01.016 Wessels, K. J., Prince, S. D., Frost, P. E., & Van Zyl, D. (2004). Assessing the effects of human-induced land degradation in the former homelands of northern South Africa with a 1 km AVHRR NDVI time-series. Remote Sensing of Environment, 91(1). https://doi.org/10.1016/j.rse.2004.02.005 [Stephen Prince, United States of America]	references added.
39071	22	23	22	16	Change to "... the Horn of Africa ..." [, United States of America]	edited
879	22	23	22	44	To say that 46 out of 57 countries in Africa are affected by desertification is a completely meaningless statement. The problems with the way desertification is defined can also seen further down whether even greening and bush encroachment are considered as forms of desertification. How is the degradation of the river basins measured? And over which periods? The percentages given here do not say much. On Lake Chad I recommend you to consult the article by Géraud Magrin in Journal of Political Ecology https://journals.uair.arizona.edu/index.php/JPE/article/view/20191/19819 [Tor A. Benjaminsen, Norway]	Noted. Edited to ' It is estimated that 46 out of the 54 countries in Africa are vulnerable to desertification, with some already affected' .Any Persistent reduction in biological procuctivity,ecological complexity and human values in dylands is considered as desertification.Reference on Lake Chad added

Comment No	From Page	From Line	To Page	To Line	Comment	Response
23903	22	25	22	25	It may be noted that the cited paper (Damberg and AghaKouchak 2014) analysed all regions except areas with perpetual droughts such as deserts, hence the recent drying identified in this study was not over drylands but over the humid Indo-Gangetic plains in north India. So this study is not relevant to this chapter section of SRCCL on observed trends in regional desertification. [, India]	Rejected. Drylands are not necesseraliy deserts; they are arid, semi-arid and dry-subhumid areas. The study covers 60deg North and South where drylands are part
39073	22	25	22	25	Sharon Nicholso also has a 2017 paper looking at all of Africa. [, United States of America]	Noted.
32115	22	26	22	26	There is a case study on desertification in the Sahel in the IPBES LDRA in Chapter 4, sect 4.2.6.2. [Stephen Prince, United States of America]	Included in the case study section. Refer to section 3.8.2.3
39075	22	37	22	38	Add citation for 16x statement. [, United States of America]	statement deleted
2825	22	42	22	43	"… of less productive lands (e.g., Anyamba and Tucker, 2005), Thomas and Nigam…" [Bettina Weber, Germany]	Added
40577	22		22		example of recent trend (area of cropland in Sahel) relevant for ES / SPM. [Valerie Masson-Delmotte, France]	Information included
18303	22	15	26	12	There are no Eastern Europe (southern Ukraine and Russia), regions of temperate latitudes of Northern Asia (southern regions of Russia up to the Far East, Kazakhstan, Kyrgyzstan) in the review of the regional distribution of desertification. It appears that data on desertification in these regions, reported by Prăvălie, R., 2016 (Drylands extent and environmental issues. A global approach. Earth-Science Rev., 18 161, 259–278, doi: 10.1016 / J.EARSCIREV.2016.08.003) does not take into account information from numerous national sources published mainly in Russian. For example, according to P.D. Gunin and E.I. Pankova (2004), by estimates of recent years the total land area in Russia that is under desertification makes up 1.3 million km2. [Anatoliy Mandych, Russian Federation]	Accepted, added.
18305	22	15	26	12	Gunin, P.D., and E.I. Pankova. "Contemporary Processes of Degradation and Desertification of Ecosystems of the East Asian Sector of Steppes and Forest-Steppes" In Modern Global Changes of the Natural Environment, 389-412. Moscow: Scientific World, 2004. [Anatoliy Mandych, Russian Federation]	Accepted.
12675	22	15	26	12	The entire subsection 3.3.1.2 discusses desrtification in Africa (3.3.1.2.1), Middle East and Europe (3.3.1.2.2), Asia (3.3.1.2.3), Australia (3.3.1.2.4), Latin America and the Caribbean (3.3.1.2.5) and North America (3.3.1.2.6). But the West Asia and Middle East and Europe subsections suppost to include West Asia and Arabian Peninsula don't cover these important areas having quite big desert bodies. This is a serious deficiency in the report. Subsection Middle East and Europe covers mostly Europe and Asia covers mostly south, east and central Asia. [, Saudi Arabia]	Accepted, the information on the Arabian Peninsula is added and placed under Asia section.
23565	22		26		It is suggested that the severity of desertification at the regional scale is represented by maps, and the severity of desertification in different regions and countries is also different. The map representation should be clearer and the environmental profile can be summarized. [Huai Jianjun, China]	Rejected. Mapping of desertification in both global and regional scales has been done using varied methodologies basing on different definitions. For this reason there's inconsistency in the figures reported with no single value given across the many published literature on this area.Therefore this report assesss and report on the values given with some degree of agreement.
7477	22		26		The regional scale desertification should be tabulated on the basis of the location, percentage range, years, etc. This will make it make readble interms of clarity and regional intensity. [Onema Adojoh, United States of America]	Rejected. Mapping of desertification in both global and regional scales has been done using varied methodologies basing on different definitions. For this reason there's inconsistency in the figures reported with no single value given across the many published literature on this area.Therefore this report assesses and reports on the values given with some degree of agreement.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
15123	22	22	33	31	It would be interesting to provide cartographic illustrations to support the demonstration [Ibouraïma Yabi, Benin]	Rejected. Mapping of desertification in both global and regional scales has been done using varied methodologies basing on different definitions. For this reason there's inconsistency in the figures reported with no single value given across the many published literature on this area.Therefore this report assesss and report on the values given with some degree of agreement.
28649	22	15		44	Lake chad is a clear and comprehensive example of desertification and la d desertification in Africa on a regional scale. For combating desertification in lake chad and the impacts of climate change, i recommend; Vulnerability Adaptive response, Mitigating Adaptive measures, and ecological preventive measures, land use Adaptive response, Land management, forest management, forest and land protection Agency. Recommendations as follow; Integrated Combat system in desertification process, Integrated Combat system on land, rivers and lake protection, Integrated Combat system in Irrigation and land use in relation to land degradation and drought, open source public awareness process. Adaptive measures and mitigating strategy in relation to ecological catastrophe labelled by the United Nations food and Agriculture organisation. Integrated combat system in relation to Human Population expansion and unsustainable human water extraction from lake chad. Integrated Combat system in relation to species natural disappearance. [Abiodun Adegoke, Nigeria]	Noted. Information on Lake Chad included
18325	22	15			A figure sumarizing the trends (with uncertainty range) in areas affected by desertification for each of these regions would be helpful. At present it is not easy to grasp the overall message from this part. [Edouard Davin, Switzerland]	Rejected. Mapping of desertification in both global and regional scales has been done using varied methodologies basing on different definitions. For this reason there's inconsistency in the figures reported with no single value given across the many published literature on this area. Therefore this report assesss and report on the values given with some degree of agreement.
8145	23	1	23	2	"In arid Algerian High Plateus, desertification due to both climatic and human causes led to the loss of indigenous plant biodiversity and overall loss of vegetation between 1975 and 2006". How much loss of indigenous plant biodiversity caused by climatic and human activities? [Haruni Krisnawati, Indonesia]	Accepted. Values are now provided."indigenous plant biodiversity,Stipa tenacissima to a value of 1/10 from 2/3 of a landscape and general loss of vegetation from domination of Salsola vermiculata between 1975 and 2006
8257	23	1	23	2	Please provde quantitatve assessment, by how much, provide percentages . This can be found through grey literature. [Noureddine Yassaa, Algeria]	Agreed. Numbers and percentages (including ranges) have been given where possible
2275	23	4	23	5	While this section is meant to be on desertification, these lines seem to speak of land degradation more generally. Suggest removing this reference. [Nina Hunter, South Africa]	Rejected. Degradation in any dryland area of the globe is considered desertification
487	23	8	23	31	I would add a reference to the paper by Hiernaux et al. (2009), who quantified the rate of increase of cropland from 1994 to 2006 in Niger (Hieraux et al., Journal of Hydrology, T375 (2009) 65–77), to state the fact that this increase is also observed in countries among the less developped in the world and under the most critical precipitation regime in the Sahel. [Beatrice Marticorena, France]	Reference included.
11835	23	14	23	15	Provide the size of Meru conservancy in km^2 [Hans Poertner and WGII TSU, Germany]	Included
39077	23	16	23	16	Pricope et al. (2015) also documented NDVI declines, population growth, and land cover change nexus in East Africa. [, United States of America]	Included
2277	23	29	23	31	For the studies cited here, are they on dryland areas and therefore justified in receiving attention in this chapter on desertification? [Nina Hunter, South Africa]	Yes, Southern Africa is a dryland region

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2279	23	41	23	42	But is this greening of dryland areas, and therefore justified in being included in this chapter? [Nina Hunter, South Africa]	Noted. Trends could be positive or negative. So both browning and greening are applicable to this chapter/section
21689	23	33	25	8	The Persian gulf and the Arabian peninsula region suffers acute desertification problem but surprizingly not being mentioned at all in this section. [Mustafa Babiker, Saudi Arabia]	Accepted, included.
21931	23	1		7	3.3. Observations of Desertification and Attribution, 3.3.1.Status and Trend of Desertification., 3.3.1.2.Regional scales, 3.3.1.2.1. Africa.How much indigenous plants biodiversity and overall vegetation was lost at the Algerian Plateau and North Africa between 1975 and 2006 [Olusegun Adeaga, Nigeria]	Accepted. Values are now provided."indigenous plant biodiversity,Stipa tenacissima to a value of 1/10 from 2/3 of a landscape and general loss of vegetation from domination of Salsola vermiculata between 1975 and 2006"
11837	23	22			Is Bontioli the only example for a reserve or are there perhaps others? [Hans Poertner and WGII TSU, Germany]	The text has been edited accordingly
28651	23	24		26	Evaluating hydrological response of land degradation in Owena river basin in western Nigeria. 18.56 per cent of the tree cover was not lost entirely to land degradation but also Agriculture food production. The river is heavily covered by trees which needs to be reduced for agriculture purpose in yhe area. I recommend Land use and river basin evaluating techniques, analysis, stating tge process and the adaptive response in relation to the case study of Owena river basin and at global insight. This region is experiencing heavy logging which will results is loss of land and forest loss to the river basin. I recommend a strict actions by the government, UN to take control local logging and invest in trees planting process. [Abiodun Adegoke, Nigeria]	Noted. Thank you for the information, although it's beyond the scope of this report to instruct government/UN on what to do regarding the activities around the Owena basin. It can only report what is in the published literature which will be useful information for policy makers in formulating and implimenting government policies
3599	23	26			Le and collegues (2012)? [Cordula Ott, Switzerland]	Rejected, unfortunately we could not understand this comment.
3597	23	31			missing comma in reference [Cordula Ott, Switzerland]	added
22015	23				A number of African countries experience both flooding season and drought season at the same year, which shake and reconstruct hydrological water-soil structure pattern, degrade land mass and leading to loss in soil productivity, hence averaged annual rate or pattern of soil moisture can be tricky, and not representing the actual fluctuations during the year [Hala Abayazid, Egypt]	Noted.
5471	24	8	24	11	We suggest to add Hungary which shows high sensitivity to desertification (ECA: Desertification in the EU, 2018) [, Hungary]	Noted. However Hungary is not the country with high sensitivity to desertification in ECA (2018). In the new Europe sub-section "3.3.1.2.2 Europe", we have made a new assessment such this based on that reference: "According to a recent assessment report for the Europe (ECA, 2018), Europe is increasingly affected by desertification leading a growing threat with significant effects on the use of land. The risk of desertification is most serious in southern Portugal, parts of Spain and southern Italy, south-eastern Greece, Malta, Cyprus, and the areas bordering the Black Sea in Bulgaria and Romania."
5469	24	8	24	21	It would be useful to visualize the vulnerable areas on a map. [, Hungary]	Rejected. Mapping of desertification in both global and regional scales has been done using varied methodologies basing on different definitions. For this reason there's inconsistency in the figures reported with no single value given across the many published literature on this area. Therefore this report assesss and report on the values given with some degree of agreement.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
19017	24	26	24	27	It may be noted that the cited paper (Damberg and AghaKouchak 2014) analysed all regions except areas with perpetual droughts such as deserts, hence the recent drying identified in this study was not over drylands but over the humid Indo-Gangetic plains in north India. So this study is not relevant to this chapter section of SRCCL on observed trends in regional desertification. [Sanjay Jayanarayanan, India]	Rejected. The study area in (Damberg and AghaKouchak 2014) is 60 deg South and North in which drylands are part of. Drylands are not exclusively deserts. Deserts are not prone to desertification.
1453	24	32	24	38	Some key references about desertification monitoring in China should be cited here, and the description of the desertification progress in some key regions should be added, such as Farming-Pastoral Ecotone of Northern China. [Duanyang Xu, China]	Acccepted. Reference included.More of this work is addressed in the case study section3.8.2.1The Experiences of Combating Desertification in China
3477	24	35	24	38	“Throughout the 18th and 19th centuries, sandy desertification took place on the Mongolian Plateau, north-eastern China, and the Yellow River basin (Lamchin et al., 2016) due to shifts in monsoons and wind activity during the Little Ice Age with a significant increase in aridity observed in the Northern region (Hua et al., 2014)”, please check the references, because the paper of Lamchin et al. (2016) only focuses on Mongolia with remote sensing data, which cannot provide information for the 18th and 19th centuries; furthermore, the finding of Hua et al. (2014) is different from the express in this sentence. I suggest to delete this sentence. [Jianqi Sun, China]	Noted. Texts edited and references put accordingly
39079	24	40	24	40	Is there a more recent Aral sea reference? [, United States of America]	Accepted, added.
11839	24	40	24	41	Explain what is meant by "massive environmental catastrophe" [Hans Poertner and WGII TSU, Germany]	Text edited accordlingly
1821	24	43	24	43	The precipitation over the period mentioned was higher than what? [William Lahoz, Norway]	Accepted. Text edited accordlingly
40581	24		24		shfits in monsoons : when, mechanism? More info needed here. The paragraph does not refer to glacier melt implications. [Valerie Masson-Delmotte, France]	Acepted. Text edited accordlingly
8971	24	43	25	3	The main reason of that was not the drought but the overgrazing and limited amount of river water provided to the deltaic area [Jean-Luc Chotte, France]	Accepted. Information added with a new reference
3595	24	11			missing comma in reference [Cordula Ott, Switzerland]	Noted. Text edited accordlingly
8163	24	13			"Turkey is considered highly vulnerable to drought, land degradation and desertification." Land degradation may be useful to be explained in Chapter 4 [Haruni Krisnawati, Indonesia]	Noted. Agreed
39081	25	3	25	4	It would be good to expand here on on how irrigation/poor water management leads to salinization. [, United States of America]	Explained in the processes section see 3.
8259	25	4	25	4	Please use IPCC calibrated uncertainty qualitative and quantitative languages throughout the text, e;g; highly likely. [Noureddine Yassaa, Algeria]	Noted. Used accordingly
6845	25	5	25	8	The Yinchuan Plain belongs to the Yellow River Basin. Please delete “Yinchuan Plain, a major irrigation agriculture district in northwest China” [Changke Wang, China]	Accepted. Text edited acccordingly
32123	25	10	25	27	There are two Queensland studies. Jackson, H., & Prince, S. D. (2016). Degradation of Non-Photosynthetic Vegetation in a Semi-Arid Rangeland. Remote Sensing, 8(8), 692. https://doi.org/10.3390/rs8080692 Jackson, H., & Prince, S. D. (2016). Degradation of net primary production in a semiarid rangeland. Biogeosciences, 13(16), 4721–4734. https://doi.org/10.5194/bg-13-4721-2016 [Stephen Prince, United States of America]	The second reference is added. "Jackson and Prince (2016) used a local NPP scaling approach applied with MODIS derived vegetation data to quantify degradation in a dryland watershed in Northern Australia from 2000 to 2013. They estimated 20% of the watershed to be degraded."
23479	25	27	25	27	Suggest qualifying final sentence with recognition that impacts are nuanced depending on environment. [Nicholas Webb, United States of America]	As stated this study is in eastern Australia. No change made.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4141	25	30	25	31	Yes, Granados-Sanchez et al. 2012 indicate that about 516 million hectares in Latin America are susceptible to desertification. Nevertheless, this statement in this article is not properly justified with references (As far I know Granados-Sanchez made a review article, without re-analyzing any kind of data!). These authors then provide this same number for South America (Table 1), which was taken from data published elsewhere. Latin America is quite different from South America, because it also includes Central America. Considering such uncertainties in the original source, this “estimated” area is not confident -i.e. it´s not clear what specific regions are representing-. [Eugenia Gayo, Chile]	Accepted. Different references have been incorporated
39083	25	35	25	44	Here and in other parts of the chapter there is only discussion of the 'extent' of degradation, and no mention of 'depth' - to use terms from epidimiology. [, United States of America]	Accepted. The section addresses both extent and severity- depending on the availabilty of the information in the literature
4143	25	37	25	38	I suggest to include data from Armesto et al. 2010 for expanding evidences for causes and trends in desertification in semi-arid Chile. [Eugenia Gayo, Chile]	Accepted, reference included
4145	25	37	25	38	The full reference for this is: Armesto, J.J., Manuschevich, D., Mora, A., Smith-Ramirez, C., Rozzi, R., Abarzúa, A.M., Marquet, P.A., 2010. From the Holocene to the Anthropocene: A historical framework for land cover change in southwestern South America in the past 15,000 years. Land Use Policy 27, 148-160. [Eugenia Gayo, Chile]	Accepted, reference included
39085	25	37	25	38	What is the citation for these very big numbers for Bolivia? [, United States of America]	Noted, clarified and text has been edited accordingly.
2281	25	38	25	43	This seems to deal with degradation and not desertification. Should it be included here? [Nina Hunter, South Africa]	Rejected. Degradation in any dryland area of the globe is considered as desertification
3789	25	40	25	48	In central Sudan (ELRAWAKEEB Area) about 18 different seed bank species were identified of which 16 species are annuals and only 2 soecies are parenials (no seeds for trees or shrubs. This means trees may not grow again even after heavy rains [Mustafa Elhag, Sudan]	Noted,thanks.Though I could not find a reference for this
41509	25	44	25	44	cause of 50% of area being degraded? Link with precipitation trends? [Valerie Masson-Delmotte, France]	Accepted, Information added
11841	25	27			Please explain how the shrubs enhanced the services [Hans Poertner and WGII TSU, Germany]	Accepted. explained elaborately
24907	25	37			I doubt that Ecuador is prone to desertification, a reference is needed. Arid areas exists (Salinas, Chota valley, Mitad del mundo, Arenal de Chimborazo). However these areas are very restricted, easy to irrigate with occult precipitation easy to collect in the littoral areas (neblina, garoua). [Pascal Podwojewski, France]	The text has been edited accordingly
6609	25	39			Erase the parentheses after "et al." [, Mexico]	The text has been edited accordingly
32125	26	1	26	12	There is a study on desertification of SW USA Noojipady, P., Prince, S. D., & Rishmawi, K. (2015). Reductions in productivity due to land degradation in the drylands of the southwestern United States. Ecosystem Health and Sustainability, 1(8). https://doi.org/10.1890/EHS15-0020.1 [Stephen Prince, United States of America]	Accepted. Reference added
6611	26	1	26	13	To complement the information for Mexico´s drylands, we are suggesting : Pontifes, P. A., García-Meneses, P. M., Gómez-Aíza, L., Monterroso-Rivas, A. I., & Chávez, M. C. (2018). Land use/land cover change and extreme climatic events in the arid and semi-arid ecoregions of Mexico. Atmósfera, 31(4), 355-372 doi: 10.20937/ATM.2018.31.04.04 [, Mexico]	Thanks. The reference has been included

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39087	26	9	26	10	The statement "sand dune encroachment has been identified as a cause of desertification in California, USA (Lam et al., 2011)" is not accurate and highly misleading. A re-reading of Lam et al. (2011) shows that this study neither documents high rates of sand dune encroachment anywhere in the region nor makes actual linkages to widespread desertification in California. A more relevant reference is Potter and Weigand (2016, Analysis of Desert Sand Dune Migration Patterns from Landsat Image Time Series for The Southern California Desert, J Remote Sensing & GIS, 5:2), which documents the only important rates of dune migration in the region. [, United States of America]	Rejected. Liam et al 2011 used Landsat Thematic Mapper (TM) to study Kelso Dunes encroachment in Newberry-Baker, California, USA.Potter and Weigand (2016)has been referenced
39089	26	15	26	28	Add "… , as well as secondary impacts from fire and pests." [, United States of America]	Accepted. This point is implied in "other drivers of desertification vary depending on specific socioeconomic and ecological contexts"
32009	26	16	26	17	This point could be broadened as follows: "....relative contribution of climatic, anthropogenic and other factors to desertification will vary depending on specific socioeconomic, ecological and regional contexts. " [Stephen Prince, United States of America]	Accepted, done.
32011	26	17	26	19	That is resilience versus permanence. An essential point that is missing in Sect. 3.2 (See comment on p 8 line 3.) add Prince et al. 2018, where this point is dealt with in detail. [Stephen Prince, United States of America]	Accepted, reference added.
26635	26	19	26	23	This could do with more and more recent references, and more tie in to ideas of non-equilbrium range ecology. Ellis, J. Climate variability and complex ecosystem dynamics, in Scoones, Living with Uncertainty 1995 is relevant but not recent [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Two more recent references that tie in to ideas of non-equilibrium range ecology are added.
32013	26	25	26	27	Incomplete statement about climate response. I suggest - "...may take place rapidly,especially when thresholds are reached (Prince et al. 2018, sect. 4.1.2 and figures),or over..." [Stephen Prince, United States of America]	Accepted.
32015	26	29	26	37	This account of RESTREND inadequate. The NDVI/rainfall sentences are about Rain Use Efficiency, not RESTREND itself. RUE is rhe first step in RESTREND from which the residuals are calculated, yet it is not mentioned until p 27 line 18 and it is not explained. Further there is no mention of the time series (Residual TREND) in this section. Furthermore, none of the potential problems with the method are mentioned. here is some text on RUE and RESTREND. [Stephen Prince, United States of America]	Accepted. The first sentence is changed to introduce rain use efficiency "For attributing vegetation changes to climate versus other causes, rain use efficiency (RUE - the change in vegetation index per unit of precipitation) and its variations in time have been used." Potential problems with the method are discussed in subsequent paragraphs.
32017	26	31	26	33	Taking account of lags may be useful, and has sometimes been done, but it is not essential and far from universally used. [Stephen Prince, United States of America]	Noted. Here we are discussing the original method which included this.
32021	26	38	26	38	Why are the Sahel study by Rishmawi and South Africa by Wessels et al. omitted? Both make important conclusions using RESTREND. Wessels, K. J., Prince, S. D., Malherbe, J., Small, J., Frost, P. E., & VanZyl, D. (2007). Can human-induced land degradation be distinguished from the effects of rainfall variability? A case study in South Africa. Journal of Arid Environments, 68(2). https://doi.org/10.1016/j.jaridenv.2006.05.015 Rishmawi, K., & Prince, S. D. (2016). Environmental and anthropogenic degradation of vegetation in the Sahel from 1982 to 2006. Remote Sensing, 8(11). https://doi.org/10.3390/rs8110948 [Stephen Prince, United States of America]	Noted. Both studies are discussed in later paragraphs.
32019	26	39	26	39	"Climate" cannot be said to be "responsible for..". It is just correlated "...with widespread..." [Stephen Prince, United States of America]	Accepted. Rephrased to "They conclude that climate was the dominant causitive factor"

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32039	26	29	27	24	This account of RESTREND inadequate. The NDVI/rainfall sentences are about Rain Use Efficiency, not RESTREND itself. RUE is rhe first step in RESTREND from which the residuals are calculated, yet it is not mentioned until p 27 line 18 and it is not explained. Further there is no mention of the time series (Residual TREND) in this section. Furthermore, none of the potential problems with the method are mentioned. Folowing comments is some text on RUE and RESTREND (Cannot add formatted text to one Excel cell, hence spread over several cells). [Stephen Prince, United States of America]	Accepted. The first sentence is changed to introduce rain use efficiency "For attributing vegetation changes to climate versus other causes, rain use efficiency (RUE - the change in net primary productivity (NPP) per unit of precipitation) and its variations in time have been used (Prince et al., 1998)." Potential problems with the method are discussed in subsequent paragraphs.
32041	26	29	27	24	RUE/RESTREND [Stephen Prince, United States of America]	Noted
32043	26	29	27	24	These two metrics aim to measure the NPP, rainfall and the time dimensions. They are simple transforms of the same three variables: RUE shows the NPP relationship with rainfall for individual years, while RESTREND is the interannual change of RUE. They are legitimate metrics when used appropriately, but in many cases they involve oversimplifications and misleading results. This is frustrating since their earliest applications made many of the issues clear. (This is part of the wider problem you mention, that is the disconnect between many remote-sensing studies and the ecological conditions that constitute degradation - and are observed in the field). The list of conditions below is the council of perfection, needed to ensure totally valid results. While lack of adherence to all may be acceptable, the potential sources of error as a result of incomplete correction should always the stated. [Stephen Prince, United States of America]	Noted.
32045	26	29	27	24	Two aspects affect their usefulness. [Stephen Prince, United States of America]	noted
32047	26	29	27	24	Sentences in italics are either important (red) or less important / easy to include (green) [Stephen Prince, United States of America]	noted
32049	26	29	27	24	1. Hydrological: see highlighted section of the following paper (attached): [Stephen Prince, United States of America]	noted
32051	26	29	27	24	Prince, S. D., De Colstoun, E. B., & Kravitz, L. L. (1998). Evidence from rain-use efficiencies does not indicate extensive Sahelian desertification. Global Change Biology, 4(4), 359–374. https://doi.org/10.1046/j.1365-2486.1998.00158. [Stephen Prince, United States of America]	noted
32055	26	29	27	24	2. Ecophysiological: see highlighted section of the following paper (attached): [Stephen Prince, United States of America]	noted
32057	26	29	27	24	Rishmawi, K., & Prince, S. D. (2016). Environmental and anthropogenic degradation of vegetation in the Sahel from 1982 to 2006. Remote Sensing, 8(11). https://doi.org/10.3390/rs8110948 [Stephen Prince, United States of America]	noted
32059	26	29	27	24	i. The fundamental problem with RUE/RESTREND is that vegetation growth (NPP) can only change slowly compared with rainfall variations. Thus short term changes in rainfall can cause dramatic fluctuations in RUE for simple algebraic reasons - since NPP responds slowly to rainfall, but rainfall typically changes much more rapidly especially in drylands - RUE (NPP/rainfall) is high in dry years and low in wet years even with no change in NPP or slow responses in, for example, many perennials and trees. Valid use of RUE/RESTREND clearly depends on scaling the interannual rainfall to the NPP response. This requires some function of rainfall over a number of years which generally varies between plant functional types (e.g. trees and herbs, C3/C4) for which rates of response to rainfall are direct. Detection of lags and use of weighted, antecedent rainfall addresses, but does not eliminate, the problem. [Stephen Prince, United States of America]	Accepted. A paragraph further discussing limitations of the methods has been added. "These studies represent the best regional, remote sensing based attribution studies to date, noting that RESTREND and RUE have some limitations (Higginbottom and Symeonakis, 2014). Vegetation growth (NPP) changes slowly compared to rainfall variations and may be sensitive to rainfall over extended periods (years) depending on vegetation type. Detection of lags and the use of weighted antecedent rainfall can partially address this problem though most studies do not do this. The method addresses changes since the start of the time series, it cannot identify whether an area is already degraded at the start time. It is assumed that climate, particularly rainfall, are principle factors in vegetation change which may not be true in more humid regions."

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32061	26	29	27	24	ii. The necessity of a reference or baseline RUE against which to compare values from potentially degraded sites. The reference (potential) NPP is usually detected by regression using data for all sites, some at their potential and others degraded, but which is which is unknown. The regression of NPP on rainfall is inevitably affected by sites that are degraded, reducing the slope and the estimation of reference NPP. [Stephen Prince, United States of America]	Accepted. See response to comment 32059
32063	26	29	27	24	iii. Factors other than rainfall can be significantly related to changes in NPP (Rishmawi 2016), so normalization by rainfall alone misses other non-degradation related differences which affect RUE since rainfall may not be the principal factor. Although RUE/RESTREND are based on rainfall, the same approach can be used with other factors, such as non-photosynthetic vegetation (Jackson 2016?) and bare ground. However, most of the provisos for RUE/RESTREND also apply to these [Stephen Prince, United States of America]	Accepted. See response to comment 32059
32065	26	29	27	24	iv. Other requirements for valid use of RUE to detect degradation include (Rishmawi and Prince 2016): [Stephen Prince, United States of America]	Accepted. See response to comment 32059
32067	26	29	27	24	· If annual rainfall is used, NPP must respond to rainfall within that year with no carry-over from earlier years. Some studies attempt to allow for the effects of lags due to antecedent rainfall, but depend on empirical estimates using the same data which is subsequently used to calculate RUE/RESTREND. [Stephen Prince, United States of America]	Accepted. See response to comment 32059
32069	26	29	27	24	· There are no supplements to rainfall, for example, neither significant run-on from neighboring areas nor run-off (can be minimized by time-series analysis of a single or small group of pixels (see hydrology above). [Stephen Prince, United States of America]	Accepted. See response to comment 32059
32071	26	29	27	24	· Within-season temporal patterns of rainfall do not affect NPP i.e. the same rainfall in early, mid, senescent and dormant phases causes the same increment in NPP. Some studies restrict the rainfall to the total for the growing season, but there are still significant variations in response within the growing season. [Stephen Prince, United States of America]	Accepted. See response to comment 32059
32073	26	29	27	24	· The rainfall–NPP relationship does not vary between wet and dry years. Difficult to ensure because wet conditions may reach the non-linear effects of rainfall and because of the algebraic effect – see 2i above. [Stephen Prince, United States of America]	Accepted. See response to comment 32059
32075	26	29	27	24	· Interannual trends in deviations between degraded and reference NPP are linear for periods equivalent to the rate of response of the vegetation to rainfall. Rapid changes suggest RUE is responding to variations in rainfall rather than NPP. [Stephen Prince, United States of America]	Accepted. See response to comment 32059
32077	26	29	27	24	· Deviation of ΣNDVI from the potential is a result of land degradation, and no other processes. [Stephen Prince, United States of America]	Accepted. See response to comment 32059
32007	26	15	28	26	This treatment is in contrast to the somewhat muddled section 3.2.1. Maybe try to harmonize? [Stephen Prince, United States of America]	Noted. Section 3.2.1 provides a broad overview of desertification while this section is a more detailed discussion of the attribution problem. They are necessarily different.
3605	26	14	30	8	This subchapter includes important elements on the dryland/desertification interface. They as well as the attribution gap could be included in a paragraph (at the beginning of the discussion) see also comment on 4.2.4.3) [Cordula Ott, Switzerland]	Noted. The desertification definition (in glossary and section 3.2.1) states that desertification takes place within drylands.
6613	26	15	30	8	The information is poorly structured; we suggest more efforts to clarify the main ideas around the attribution of desertification [, Mexico]	Noted. Text has been ammended in line with other comments on this section.
3601	26	4			Rocio and collegues (2015)? [Cordula Ott, Switzerland]	Accepted, citation corrected
3603	26	14			Is this wording correct? I do not understand the title: what is the idea of this subchapter? [Cordula Ott, Switzerland]	Noted. Yes, wording is correct. "Attribution of Desertification" refers to identifying/quantifying the causes of desertification

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11843	27	9	27	11	What did these studies find ? [Hans Poertner and WGII TSU, Germany]	Accepted, sentence added "In each of these studies the extent to which desertification can be attributed to climate versus other causes varies across the landscape."
32023	27	12	27	15	It would be more logical to move lines 12 - 15 up to the account of the RESTREND technique on page 26 , lines 29 - 37. [Stephen Prince, United States of America]	Accepted. This paragrpah is now preceeded by another paragraph discussing limitations of the method. See response to comment 32059
8261	27	16	27	22	Use IPCC definition for abrupt change, turning point, tipping point,…. [Noureddine Yassaa, Algeria]	Accepted. "or turning point" is added
32025	27	18	27	19	I think this is the first mention of RUE. It is not defined, nor are its strengths and weaknesses noted. It was introduced before RESTREND and forms a key part of it, so, logically, an account should come before RESTREND. The first use of RUE and details of the technique are in Prince, S. D., De Colstoun, E. B., & Kravitz, L. L. (1998). Evidence from rain-use efficiencies does not indicate extensive Sahelian desertification. Global Change Biology, 4(4), 359–374. https://doi.org/10.1046/j.1365-2486.1998.00158. [Stephen Prince, United States of America]	Accepted. RUE now introduced earlier. See response to comment 32039
32027	27	18	27	19	And the global application by Bai et al should surely be mentioned.Bai, Z. G., Dent, D. L., Olsson, L., & Schaepman, M. E. (2008). Proxy global assessment of land degradation. Soil Use and Management, 24(3), 223–234. https://doi.org/10.1111/j.1475-2743.2008.00169.x [Stephen Prince, United States of America]	Accepted. This study is discussed in 3.3.1.1. A sentence making this explicit has been added "Global applications of RUE trends to attribute degradation to climate or other (largely human) causes has been performed by Bai et al. (2008) and Le et al. (2016) (see section 3.3.1.1).
6893	27	25	27	37	In the attribution analysis of desertification, only negative impacts are involved in the impact of human activities, and there is no mention of the positive impact of artificial vegetation construction on the reversal of desertification, especially China's work. [Xin-Rong Li, China]	Noted. The positive impact of vegetation planting is covered in the case study on green walls, green dams and green belts (3.8.2). Here the focus is on attribution of desertification to its causes.
39091	27	26	27	26	Figure 3.7 is based on observed GIMMs, not NDVI? [, United States of America]	Noted. As stated in the figure caption the dataset used in figure 3.7 is the GIMMS NDVI 3g v1 dataset. GIMMS is the Global Inventory Modeling and Mapping Studies. This has been clarified in the figure caption.
6615	27	21			Please be more precise since the Soviet Union had actually dissolved and new States has been formed [, Mexico]	Accepted, 1991 has been added
21095	28	2	28	10	While a significance analysis was performed for the assessment of the impact of climate and land-use, the contribution of CO2 fertilisation is taken as granted from the relationship described in Franks et al. (2013). It would have been good to find a way to illustrate also the fact that the contribution of CO2 fertilisation may not be as smooth and overwhelming as figure 3.7.a suggests and that various paper discuss it and give hint at spatial variability of the effect (e.g. Lévesque, Mathieu, et al. "Increased water-use efficiency does not lead to enhanced tree growth under xeric and mesic conditions." New Phytologist 203.1 (2014): 94-109.). [, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, text has been added "While many studies find widespread influence of CO2 fertilisation it is not ubiquitous, for example Lévesque et al (2014) find little response to CO2 fertilisation in some tree species in Switzerland/northern Italy."
3791	28	25	28	26	This vicious circle could be broken only by alternative livelihoods [Mustafa Elhag, Sudan]	Noted.
11845	28	3			This is Figure 3.7 - did you intend to refer to Figure 3.6 here instead? [Hans Poertner and WGII TSU, Germany]	Accepted, done.
32029	29	1	29	1	Add a few words about PEA. [Stephen Prince, United States of America]	Rejected, The study used mutliple methodologies which we do not have the space to describe here. Text is changed to "Using multiple extreme event attribution methodologies, Uhe et al. (2018) showed that..."

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39093	29	1	29	3	Sea surface temperatures where? This statement attributes the droughts to the SST pattern in the Pacific, although the 2016-2017 La Nina was a very weak case. However, there was also a negative Indian Ocean Dipole which could have led to below average rains in the Greater Horn of Africa. Lyon (2014) notes the relationship of drought during OND rains in the Greater Horn to both La Nina and the negative phase of the IOD. The caveat being that they are not completely independent but enough so to note them. It would seem prudent to also mention the IOD. https://journals.ametsoc.org/doi/full/10.1175/JCLI-D-13-00459.1 [, United States of America]	Noted. This sentence reports the findings of a single study which provides an example where climate change was not found to be a dominant factor. We are not introducing a discussion of the relative role of different ocean basins on climate variability.
5763	29	1	29	4	it is right to say that "dominant influence for droughts in Eastern Africa during … (La Niña in that case)" any indicator, references … [Sanaz Moghim, Iran]	Accepted, reference given in next sentence
24757	29	3	29	4	"drought conditions" here refer to single drought events? [Annalisa Cherchi, Italy]	Noted, Here "drought conditions" refers to "droughts in Eastern Africa during 2016–2017 October November December 'short rains' season", as stated earlier in the sentence.
24759	29	6	29	7	and how is this linked to East Africa? It should be explained, at least explaining why this sentence is worth mentioning here [Annalisa Cherchi, Italy]	Noted. sentence removed.
39095	29	6	29	7	There have been substantial updates to the East Africa long rains analysis. Suggest something like "PEA attribution of the 2017 East Africa March-June drought identifies strong links to human-induced warming in the West Pacific (high confidence), with this warming also explaining the long term decline in this season (Funk et al. 2018)." REF: BAMS attribution issue, Funk et al. 2018 Q. J or Royal Met Society. [, United States of America]	Accepted, text is added "Funk et al. (2019) found the 2017 March-June east African drought was similarly influenced by western Pacific SST, however they attributed these high SST to climate change."
1823	29	7	29	7	gasses -> gases. Here and elsewhere. [William Lahoz, Norway]	Accepted, done.
26637	29	8	29	28	This paragraph suffers from imprecision over which human activities contribute to, or are alleged to contribute to, desertification. Debates on overgrazing, fuelwood collection and charcoal making need to be addressed, and possibly the more anecdotal discussions of the contribution of sand and gravel collection for construction, and digging up of dryland natural products. In Sudan in the 1980s there was considerable discussion of the contribution to desertification of semi-mechanised extensive rainfed farming incentivised by inappropriate incentives, but I am not sure if this continues to be the subject of literature or was ever a major issue outside Sudan [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Noted. This imprecision reflects the wide variety of human activities considered or not in the various studies. We have covered the relevant literature as comprehensively as possible. No references given for the Sudan example.
32005	29	9	29	12	Do you mean "....There are numerous local case studies on attribution of desertification, which use different periods, focus on different land uses and covers and consider different desertification processes. For example, two-thirds of the observed expansion of the Sahara Desert from 1920–2003 has been attributed to natural climate cycles (the cold phase of Atlantic Multi-Decadal Oscillation and Pacific Decadal Oscillation) (Thomas and Nigam, 2018). " ? [Stephen Prince, United States of America]	Accepted, change made.
39097	29	12	29	12	Change 'Drought is considered' to 'Some consider drought to be' [, United States of America]	Accepted, change made
32031	29	12	29	12	Page 26, lines 17-19 (correctly) disagrees. Climate cannot cause desertification. [Stephen Prince, United States of America]	Rejected. Page 26, lines 17-19 does not claim that climate cannot cause desertification.
2827	29	29	29	29	" This kaleidoscope of local studes demonstrates how…" [Bettina Weber, Germany]	Accepted, change made

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32033	29	29	29	29	"Kaleidoscope" is a good description. The apparently random cases throughout sect 3.3.1.2 are very difficult to follow. First, I suggest putting all the technique descriptions together at the start, then move the individual study results to a (large) table noting site, date, authors, method (with any advantages/disadvantages), and the main conclusions. The text could offer generalizations and conclusions about the studies. [Stephen Prince, United States of America]	Thank you for this suggestion. However, an attempt to produce such a table found that there are almost as many methods as studies and introducing such a table would use more space than the current text summary so has not been implemented. Generalizations and conclusions based on the studies appear in the following paragraph.
8717	29	33	29	34	The impact of human activities in relation with production and consumption patterns could be better highlighted, especially if we think that landfills can be seen as a type of "lost soil" [Mihaela Stefanescu, Romania]	Noted. Production and consumpion patterns are addressed in Chapter 5.
39099	29	34	29	35	This is well said, ""Finally, desertification manifests as a gradual change in ecosystem composition and structure (e.g., woody shrub invasion into grasslands)"" but the earlier analysis focused on NDVI seems quite at odds with this ecosystem/landcover change approach -- essentially focusing on desertification as a change in NDVI? [, United States of America]	Noted, limitations of using satellite data such as NDVI is discussed in 3.3.1.1
24761	29	39	29	45	Not clear the meaning/relevance of this sentence in terms of "Attribution of desertification" [Annalisa Cherchi, Italy]	"including their causes" has been added to clarify
32035	29	43	29	45	How can airborne data address these issues - and which issues are you thinking of? The use of high-resolution satellite data is, presumably, connected with this. High-resolution deserves a paragraph in the techniques section, maybe Sect 3.3.1 page 18 line 17 to page 19, line 10. [Stephen Prince, United States of America]	Noted, some of the issues are related to spatial scales and measurement accuracy. airborne data directly addresses both of these.
18327	29	6			this statement about ocean warming seems to have nothing to do with the topic [Edouard Davin, Switzerland]	Accepted, sentence deleted.
11847	29	21			"Evidence shows" It might be appropriate to assess the evidence and agreement here using calibrated IPCC language [Hans Poertner and WGII TSU, Germany]	Accepted, text changed to "Feng et al. (2015) shows..."
7049	30	2	30	2	It might be useful to be explicit that you are referring to human drivers of desertification [Debra Roberts, South Africa]	Accepted, "of desertification" added.
39101	30	2	30	2	Here and elsewhere consider 'location-specific' rather than 'context-specific'. [, United States of America]	Accepted, text here changed as suggested.
8263	30	10	30	10	Case studies for important dust storm events have a merit tobe presented. [Noureddine Yassaa, Algeria]	Case studies are presented in section 3.8. Case studies are chosen to illustrate interventions that have been performed to address desertification and assess their effectiveness. It is not possible for them to cover every topic. No case study for dust storm events is presented because dust storms are discussed in the text in sections 3.4.1, 3.5.1.1, 3.5.2.8, 3.5.2.9, 3.5.2.10, 3.7.3.1 and 3.8.2.1
3607	30	10	30	30	Here (and often in chapter 1), it is unclear if the perspective taken is global, regional or local. The role of the local context in defining the interlinks and dynamics (and later outcomes of interventions), could be emphasized [Cordula Ott, Switzerland]	Noted. The perspective taken is general and covers all three scales to set the scene for the subsequent discussion of feedbacks. Each scale is referred to explicitly: global on line 19; regions on line 21; and local on lines 17 and 20.
39103	30	10	30	30	This section is fine as written, but has absolutely no specifics. Why describe it if the reader doesn't learn about places where these positive and negative feedbacks are thought to be occurring? [, United States of America]	Noted. This section introduces the concept of desertification feeding back onto the climate. Subsequent text provides more detail about specific feedbacks.
39105	30	12	30	12	Use 'while' as opposed to 'whereas'. [, United States of America]	Accepted, done.
39107	30	18	30	18	It would be useful to add a sentence like "Desertification, for example, can alter surface fluxes of radiation, heat and water vapor, altering the regional or local climate." [, United States of America]	Rejected, changes in surface fluxes are implicit within the existing comment on changes in water and energy budgets.
21933	30	10		30	3.4. Desertification feedbacks to Climate. The pathways through which desrtification can feedback on climate (Figure 3.8) was not discussed in the writeup. [Olusegun Adeaga, Nigeria]	Accepted, line 21 now states "The main feedback pathways discussed throughout section 3.4 are summarised in Figure 3.8."

Comment No	From Page	From Line	To Page	To Line	Comment	Response
2283	30	25			Could you clarify, what is "sensible heat"? [Nina Hunter, South Africa]	Accepted, clarification added "(heat that causes the atmospheric temperature to rise)"
5765	31	2	31	5	Fig. 3.8 the feedbacks are not completely right! e.g. radiation absorption has positive effect on temperature, albedo and cloud effect can have both positive and negative effects on precipitation [Sanaz Moghim, Iran]	Rejected. Both "radiation absorption" and "cloud effects" clearly refer to increases in sand and dust aerosols. As aerosols increase and absorb radiation, less radiation can reach the ground and surface temperatures decreases. Increases in aerosols also increase the number of cloud condensation nucleii and hence decrease the likelihood of rain. The albedo changes clearly refer to surface vegetation changes. If the surface albedo increases then there is less radiation available to heat the ground and surface temperatures decreases, also if less near surface energy is available to initiate convection then there is a lower likelihood of rain.
39109	31	6	31	6	What about the role of BVOCs? [, United States of America]	Noted. Insufficient literature on the role of desertification in the production of BVOCs is available to include it here.
23843	31	9	31	9	Here, some of the relevant references may justify the transport of the Sahara dust to other parts like the Indian Himalayan region. These could be: Beegum et al. 2008, Journal of Earth System Science 117(S1): 303-313; Kuniyal et al. (2014) Aerosol and Air Quality Research, 15: 529–543; Sen at al. 2018 Environmental Science and Pollution Research, doi: 10.1007/s11356-018-2567-0. [, India]	Noted. No change made
32079	31	9	31	9	But this is not relevant to desertification (it is already desert). The important point is how much dust aerosols come from the arid-semiarid-dry subhumid zones. There are maps available that give some indication, e.g. Ginoux, P., Prospero, J. . M., Gill, T. E., Hsu, N. . C., & Zhao, M. (2012). Global-scale attribution of anthropogenic and natural dust sources and their emission rates based on MODIS deep blue aerosol products. Reviews of Geophysics, 50. https://doi.org/10.1029/2012rg000388 [Stephen Prince, United States of America]	Noted. quantification of dust emissions from drylands is not provided in the reference. Reference to this paper is added "Ginoux et al. (2012) estimate that 25% of global dust emissions have anthropogenic origins often in drylands."
5767	31	11	31	13	sentence needs to modified, probably add "that" after climate change [Sanaz Moghim, Iran]	Accepted, commas added for clarification
5769	31	14	31	14	"These events" which ones? [Sanaz Moghim, Iran]	Acepted, text changed to "These sand and dust aerosols"
5771	31	14	31	17	how they can affect interception? I disagree with "reducing the energy available at the land surface and increasing the temperature of the atmosphere in layers with sand and dust present"! [Sanaz Moghim, Iran]	Rejected. As stated the aerosols intercept radiation in the atmosphere. No change made.
41529	31		31		Figure 3.8 - Please write the reference or references or construction of authors [Cristobal Felix Diaz Morejon, Cuba]	Noted. Figure was constructed by a group of chapter authors. No reference needed.
41531	31	6	32	20	Please take into account that negative effects of Sahara dust storms is arriving to Caribbean Islands with negative [Cristobal Felix Diaz Morejon, Cuba]	Noted.
12677	31	6	32	39	Sand and dust storms and their effects are not covered in details and need expansion particularly after covering the Arabian Peninsula and West Asia. [, Saudi Arabia]	Noted. Sand and dust storms are discussed in sections 3.4.1, 3.5.1.1, 3.5.2.8, 3.5.2.9, 3.5.2.10, 3.7.3.1 and 3.8.2.1. , included more information on Saudi Arabia.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26271	31	7	32	20	In the section 3.4.1 clarification is needed to human effect on sand and dust storms and uncertainty should be indicated. Following reference could be used and added to Executive Summary. “Every year, an estimated 2,000 million tons of dust is emitted into the atmosphere. While much of this is a natural part of the biogeochemical cycles of the Earth, a significant amount is generated by human-induced factors, especially unsustainable land and water management.However, there is considerable uncertainty about whether sand and dust storms are increasing in intensity and frequency and how much is due tohuman causes. There is also need for greater clarity on the role that climate change is playing and how changes in dust emissions due to land use and climate change may impact the atmosphere, climate and oceans in the future.” BAN Ki-Moon, United Nations Secretary-General. Reference: UNEP, WMO, UNCCD (2016). Global Assessment of Sand and Dust Storms. United Nations Environment Programme, Nairobi. [Ahmet Şenyaz, Turkey]	Accepted. Reference to this report has been added. The quote has not been added.
15125	31	1			The source of the figure 3.8 should be specified. It would also be better to use red for negative impacts and blue for positive impacts [Ibouraïma Yabi, Benin]	Noted. Figure was constructed by a group of chapter authors. No reference needed. The end result of positive feedbacks is an increase in desertification, hence these postiive effects are shown in red.
8147	31	2			By definisiton, desertification is land degradation occurs In arid, semi-arid and sub-semi humid. I think the paramater of climatic zone needs to be included in Figure 3.8 to distinguish between desertification and land degradation [Haruni Krisnawati, Indonesia]	Noted. desertification is featured prominently in FIgure 3.8 in a red oval. No change made.
24909	31	11			Any type of crust, structural crusts have the same effect (Zobeck, 1991) [Pascal Podwojewski, France]	Accepted, reference to structural crusts has been added
24911	31	11			Zobeck, T. M. (1991). Abrasion of crusted soils: Influence of abrader flux and soil properties. Soil Science Society of America Journal, 55(4), 1091-1097. [Pascal Podwojewski, France]	Acepted. more recent reference added: Rajot, J. ., Alfaro, S. ., Gomes, L., & Gaudichet, A. (2003). Soil crusting on sandy soils and its influence on wind erosion. CATENA, 53(1), 1–16. https://doi.org/10.1016/S0341-8162(02)00201-1
23569	31				The black arrow above and below in Figure 3.8 does not mean what it means. [Huai Jianjun, China]	Rejected. Unfortunately we could not take any action, since we could not understand the comment.
5773	32	1	32	3	it depends on aerosol composition, more references! [Sanaz Moghim, Iran]	The reference given provides a review of the literature. No further references are given.
26581	32	1	32	3	You should mention the role of dust as ice nuclei and the existence of anthropogenic dust [Yves Balkanski, France]	Rejected. "cloud condensation nuclei" includes both liquid and solid water phases. The source of the dust does not change this relationship. no changes made.
5087	32	2	32	2	Suggest replacing "rain" with "precipitation" to maintain consistency between Executive Summary and other parts of the report, if there is no particular reason for using "rain" here. [, Japan]	Accepted, done.
23481	32	12	32	20	It would help this paragraph to note: 1) the positive feedback effects of aeolian processes on vegetation species and cover, 2) the impact of the dust cycle on carbon erosion and C cycle, and 3) recognition that current dust models have no capacity for representing the feedbacks and interactions with desertification. (3) could be supported with reference to - Webb, N.P., Marshall, N.A., Stringer, L.C., Reed, M.S., Chappell, A., Herrick, J.E., 2017. Land degradation and climate change: building climate resilience in agriculture. Frontiers in Ecology and the Environment, 15: 450-459. [Nicholas Webb, United States of America]	Rejected. This paragraph is discussing the literature on the feedback on climate via the direct, semi-direct and indirect effects of dust aerosols and their combinations. The first two points are made without literature support, while the third is about dust models that are not being discussed here. No change made.
5775	32	13	32	13	what this means "This would increase the amount of shortwave cooling associated with the direct effect" [Sanaz Moghim, Iran]	Noted. The direct effect is described in the first paragraph of section 3.4.1

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26273	32	16	32	20	Again in section 3.4.1, page 32, the following sentence below explains overall dust impacts on precipitation well. “However, the combined effect of dust has also been found to increase precipitation in some areas (Islam and Almazroui, 2012; Lau et al., 2009; Sun et al., The overall combined effect of dust aerosols on desertification remains uncertain with low agreement between studies that find positive (Huang et al., 2014) , negative (Miller et al., 2004) or no feedback on desertification (Zhao et al., 2015).” However, in the executive summary, only decreasing effect of sand and dust storms has been mentioned. Therefore, the summary should be changed accordingly. “Depending on the types and amounts of aerosols present, sand and dust storms increase the cloud reflectivity and decrease the chances of precipitation {3.4.1}.” [Ahmet Şenyaz, Turkey]	Accepted. The executive summary sentence is true and supported by section 3.4.1. To further acknowledge that these effects are not always present the sentence is slightly changed to "Depending on the types and amounts of aerosols present, sand and dust storms can increase the cloud reflectivity and decrease the chances of precipitation {3.4.1}.”
32081	32	18	32	20	What aspect of "desertification"? presumably not salinization or gulley erosion - so what does desertification as used here mean? [Stephen Prince, United States of America]	Noted. This refers to desertification as defined in Chapter 1, section 3.2 and the glossary.
489	32	23	32	23	A more general reference such as Jickells, et al, Science, 2005 would be more appropriate than Okin et al (2011) [Beatrice Marticorena, France]	Accepted, reference added
14679	32	29	32	30	Clarify that this surface cooling effect is caused by the dust while it is in the atmosphere. This text could be read as saying that dust on the ocean surface causes a cooling (and is reported in SPM A5.5 with this misinterpretation). [, Canada]	Accepted. Text changed to "The direct effect of atmospheric dust over the ocean was found to be a cooling of the ocean surface"
491	32	30	32	30	In this sentence, the reference to Doherty and Evan 2014 is not relevant since this paper is about the indirect effect of dust not the direct effect [Beatrice Marticorena, France]	Accepted. Reference removed.
2829	32	37	32	37	After "…dissolve (Boyd et al., 2010", please consider adding the following sentence in a new paragraph: "Dust also serves as vehicle for biological organisms to spead across regional and continental scales (Prospero et al., 2005; Fröhlich et al., 2016). These so-called soil dust particles have been described to be particularly relevant during ice nucleation processes (e.g., Conen et al., 2011; O'Sullivan et al., 2016). [Bettina Weber, Germany]	Rejected. Here we are interested in how dust effects climate, not the propagation of biological organisms. No change made.
2831	32	37	32	37	Prospero, J.M., Blades, E., Mathison, G., Naidu, R. (2005) Interhemispheric transport of viable fungi and bacteria from Africa to the Caribbean with soil dust. Aerobiologia 21: 1-19. [Bettina Weber, Germany]	Rejected. Here we are interested in how dust effects climate, not the propagation of biological organisms. No change made.
2833	32	37	32	37	Fröhlich-Nowoisky, J., and Coauthors, 2016: Bioaerosols in the Earth system: Climate, health, and ecosystem interactions. Atmos. Res., 182, 346–376, doi:10.1016/j.atmosres.2016.07.018. http://dx.doi.org/10.1016/j.atmosres.2016.07.018. [Bettina Weber, Germany]	Rejected. Here we are interested in how dust effects climate, not the propagation of biological organisms. No change made.
2835	32	37	32	37	Conen, F., Morris, C.E., Leifeld, J., Yakutin, M.V., Alewell, C. (2011): Biological residues define the ice nucleation properties of soil dust. Atmospheric Chemistry and Physics 11: 9643-9648. [Bettina Weber, Germany]	Rejected. Here we are interested in how dust effects climate, not the propagation of biological organisms. No change made.
2837	32	37	32	37	O'Sullivan, D., Murray, B.J., Ross, J.F., Webb, M.E., 2016. The adsorption of fungal icenucleating proteins on mineral dusts: a terrestrial reservoir of atmospheric ice nucleating particles. Atmos. Chem. Phys. 16, 7879–7887. http://dx.doi.org/10.5194/acp-16-7879-2016. [Bettina Weber, Germany]	Rejected. Here we are interested in how dust effects climate, not the propagation of biological organisms. No change made.
39111	32	38	32	38	Expand the dust on snow description: "… impacting a region's hydrological cycle by increasing the amount of absorbed solar radiation, leading to more rapid melt times." [, United States of America]	Accepted, sentence has been ammended. "Dust deposited on snow can increase the amount of absorbed solar radiation leading to more rapid melting (Painter et al., 2018), impacting a region’s hydrological cycle."

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7051	32	38	32	39	It will be important to add the extent to which dust on snow contributes to snow melt; which snow is being affected by this impact and which is likely to be affected in the future. If there is no study that has examined it, this should be made explicit in this paragraph. [Debra Roberts, South Africa]	Noted. Paragraph is ammended with the addition of "Dust deposition on snow and ice has been found in many regions of the globe (e.g. Painter et al., 2018; Painter et al., 2013; Kaspari et al., 2014; Qian et al., 2015), however quantification of the effect globally and estimation of future changes in the extent of this effect remain knowledge gaps."
11849	32	38	32	39	Only a single sentence re. the issue of snow? [Hans Poertner and WGII TSU, Germany]	Accepted, Another sentence has been added.
3793	32	38	32	45	salt migrationmight be due due to increasing water table on salty bedrock [Mustafa Elhag, Sudan]	Noted
16513	32	4			please add "It should be noted that sand and dust storms are transported long distances across countries and even continents by strong winds (UNEP, WMO, UNCCD; 2016)" UNEP, WMO, UNCCD (2016) Global assessment of sand and dust storms. United Nations Environment Programme, Nairoi. [, Republic of Korea]	Reference to this report has been added at the begining of section 3.4.1
2285	32	6			How is "groundwater" defined? [Nina Hunter, South Africa]	"groundwater" refers to water within the ground
24913	32	31			Aerosols deposits from Sahara can impede the formation of cyclones in the North Atlantic (Dunion et al., 2004) by decreasing the temperature and limiting the formation of vortex. [Pascal Podwojewski, France]	noted
24915	32	31			Dunion, J. P., & Velden, C. S. (2004). The impact of the Saharan air layer on Atlantic tropical cyclone activity. Bulletin of the American Meteorological Society, 85(3), 353-366. [Pascal Podwojewski, France]	noted

Comment No	From Page	From Line	To Page	To Line	Comment	Response
7537	33	1	33	26	Poleward shifting clouds represent a position feedback. See Boucher O., et al. (2013) CHAPTER 7:CLOUDS AND AEROSOLS, in IPCC (2013) CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS, Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 580 ("The effect of clouds on the Earth's present-day top of the atmosphere (TOA) radiation budget, or cloud radiative effect (CRE), can be inferred from satellite data by comparing upwelling radiation in cloudy and non-cloudy conditions (Ramanathan et al., 1989). By enhancing the planetary albedo, cloudy conditions exert a global and annual shortwave cloud radiative effect (SWCRE) of approximately –50 W m–2 and, by contributing to the greenhouse effect, exert a mean longwave effect (LWCRE) of approximately +30 W m–2, with a range of 10% or less between published satellite estimates (Loeb et al., 2009). Some of the apparent LWCRE comes from the enhanced water vapour coinciding with the natural cloud fluctuations used to measure the effect, so the true cloud LWCRE is about 10% smaller (Sohn et al., 2010). The net global mean CRE of approximately –20 W m–2 implies a net cooling with a range of 10% or less between published satellite estimates (Loeb et al., 2009). Some of the apparent LWCRE comes from the enhanced water vapour coinciding with the natural cloud fluctuations used to measure the effect, so the true cloud LWCRE is about 10% smaller (Sohn et al., 2010). The net global mean CRE of approximately –20 W m–2 implies a net cooling effect of clouds on the current climate. Owing to the large magnitudes of the SWCRE and LWCRE, clouds have the potential to cause significant climate feedback (Section 7.2.5). The sign of this feedback on climate change cannot be determined from the sign of CRE in the current climate, but depends instead on how climate-sensitive the properties are that govern the LWCRE and SWCRE."); see also Norris J. R., et al. (2016) Evidence for climate change in the satellite cloud record, NATURE 536:72–75, 72 ("Here we show that several independent, empirically corrected satellite records exhibit large-scale patterns of cloud change between the 1980s and the 2000s that are similar to those produced by model simulations of climate with recent historical external radiative forcing. Observed and simulated cloud change patterns are consistent with poleward retreat of mid-latitude storm tracks, expansion of subtropical dry zones, and increasing height of the highest cloud tops at all latitudes. The primary drivers of these cloud changes appear to be increasing greenhouse gas concentrations and a recovery from volcanic radiative cooling. These results indicate that the cloud changes most consistently predicted by global climate models are currently occurring in nature."); Bender F. A.-M., et al. (2012) Changes in extratropical storm track cloudiness 1983–2008: observational support for a poleward shift, CLIMATE DYNAMICS 38(9–10):2037–2053, 2037 ("Climate model simulations	Noted. This section is not about cloud feedbacks overall. No change made
493	33	2	33	7	It is not sufficiently stated that in the Charney's scenario, the initital change in the albedo is due to the decrease of the vegetation cover. Because it is not mentionned at the beginning of the chapter, the rest of the text is not easy to understand. [Beatrice Marticorena, France]	Text changed to say "a decrease in vegetation cover and the associated increase in albedo"
32083	33	8	33	9	Delete "deserts"? I don't think these or any hyper-arid regions are the subject of this Report. [Stephen Prince, United States of America]	Rejected. Hyper-arid areas are considered here as established in the beggining of section 3.2.1
495	33	13	33	18	This part could be shorter as it appears anecdotical compared to the change in surface albedo due to changes in vegetation . [Beatrice Marticorena, France]	Rejected. This paragraph summarizes results of a study and is n ot anecdotal. No change made.
39113	33	13	33	18	Consider impacts on the ecoystem and vegetation and people related to increased UV radiation. [, United States of America]	Rejected. Section 3.4 is focused on feedbacks to climate, not impacts on ecosystems and people which is covered in section 3.5. No change made.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
21097	33	19	33	26	A full paragraph is dedicated to the article of Rotenberg and Yakir (2010) and yet their emphasis on longwave radiation " doubling the forestation shortwave (S) albedo effect." does not emerge from this paragraph. While recognising that their generalisation might be to quick, it would be useful to add a sentence such as: "Rotenberg and Yakir (2010) showed that increased tree cover in some drylands can have a reinforced negative impact on climate change due to its impact on surface roughness. This is especially true in region with limited humidity in the air column above. [, United Kingdom (of Great Britain and Northern Ireland)]	Rejected. The paragraph is focused on the relative effect on climate of surface changes compared to GHG emisions. Due to limited space no further details are added. No change made.
11851	33	19	33	26	If it was initial, has there been a follow-up study? [Hans Poertner and WGII TSU, Germany]	Noted. "initial" has been removed.
6617	33	23	33	26	We suggest to review the sense of this sentence: is degradation of drylands contribute to reduce the radiative forcing? Is it correct? [, Mexico]	Noted. That is correct. Due largely (but not solely) to associated increases in albedo.
39115	33	23	33	26	What does a 'decreased radiation forcing equivalent' mean? [, United States of America]	Noted. Greenhouse gases interact with radiation to produce a forcing on climate. Here changes to climate due to surface changes have been calculated in terms equivalent to greenhouse gas radiative forcing. Here the surface changes caused a decrease in this forcing.
8265	33	28	33	28	What would be the impacts of green walls, green Damsand green belts constructed in dofferent desertification affected regions on the climate feedbacks [Noureddine Yassaa, Algeria]	Noted. One effect would be to decrease the albedo and hence increase the surface absorption of radiation, increasing the surface temperature - a positive feedback on global warming. However the newly planted vegetation will also fix carbon, removing CO2 from the atmosphere - a negative feedback on global warming. The net effect will largely depend on the balance between these and will vary from place to place depending on many factors.
40583	33		33		check coherency of 3.4.2 with chapter 2 (biophysical feedbacks). There is a recent paper suggesting that deployment of solar panels in Sahara would alter albedo and have large scale implications, it seems relevant for this chapter (Yan Li, Science, 2018). [Valerie Masson-Delmotte, France]	Noted. Some inconsistencies with chapter 2 were found and are being removed from chapter 2. The connection between solar panels in Sahara and desertification has not been made.
88	33	40			cabon not Carbon [Julian Dumanski, Canada]	Rejected. No mention of Carbon on this line.
5777	34	3	34	4	can we say this! Reduction …. Emissions from fire! Any reference, indicator! [Sanaz Moghim, Iran]	Accepted. Yes. Many references are given in this paragraph. Fire is addressed in the following paragraph.
6619	34	8	34	20	We suggest to highlight in this paragraph the importance to carefully analyze the woody plant use as strategy to combat desertification and carbon sequestration, since that could affect the local dynamics of drylands [, Mexico]	Noted. This section (3.4) is focused on feedbacks to climate, Technological responses, such as afforestation, reforestation are in Section 3.7.1.
243	34	9	34	9	Recommend changing to: “Increasing woody plant cover in open rangeland ecosystems leads to an increase in woody carbon stocks both above- and below-ground that may continue to increase for multiple decades.” (citation: Petrie, M. D., S. L. Collins, M. E. Litvak, A. L. Swann, and P. L. Ford (2015), Grassland to shrubland state transitions enhance carbon sequestration in the northern Chihuahuan Desert, Global Change Biol., 21, 1226–1235, doi:10.1111/gcb.12743.) [Matthew Petrie, United States of America]	Accepted. Reference added
39117	34	17	34	20	What about the role of invasives and their impact with groundwater supplies? Would hydraulic redistribution be a potential impact too? [, United States of America]	Noted. No literature that connects invasives and their groundwater impact to desertification feedbacks to climate could be found. No change made.
39119	34	22	34	22	Should 'In addition' actually be 'Conversely'? [, United States of America]	Accepted, change made.
6895	34	28	34	28	At the end of line 28, it is suggested that "increasing in coverage of biological soil crusts can significantly increase carbon storage in sandy or dryland soils (Li et al., 2012. Catena, 97: 119-126). [Xin-Rong Li, China]	Rejected. Carbon sequestered by biological soil crusts is negligible compared to other carbon stock changes reported here. No change made.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3795	34	40	34	42	one of the best examples is experience of Elrawakeeb dryland research stationn in Sudan [Mustafa Elhag, Sudan]	Accepted: We add the following reference from Sudan studies in Page 34 L42: Khairalseed, A. R. (2015). Desertification in Sudan, concept, causes and control. ARPN journal of science and technology, 5 (2): 87 – 91.
11859	34	41	34	42	Exactly how? please add details, observations/projections, case studies... [Hans Poertner and WGII TSU, Germany]	Accepted, the following sentences were added: For example, changes in composition of plant communities, as well as decreasing of plant species richness in some regions of Africa (Bellard et al., 2012; section 3.3.1.2.). Additionally, shrub encroachment as also reported for Africa North America and Australia (section 3.4.3.).
11857	34	32	36	44	This section on natural & managed ecosystems is not "complete" as there are other sections later in the chapter (e.g. on wildfires) that relate to this one. There should be cross-referencing between these sections, and it should be made clear in this section that there is other information later on [Hans Poertner and WGII TSU, Germany]	Accepted, we added cross-referencing between section of this chapter: Page 34 L41 to page 35L1: For example, changes in composition of plant communities, as well as decreasing of plant species richness in some regions of Africa as mentioned in the 3.3.1.2. section. Additionally, shrub encroachment as also reported for Africa North America and Australia (3.4.3.). P35 L11: The future projection of impacts on provision services of ecosystems is presented later on in the section 3.6.2. P35 L44-45: Thereby, the soil formation as a supporting ecosystem service is negatively affected (section 3.4.1.). P36 L29: The future projection of impacts on plant biodiversity is presented later on in the section 3.6.2.
41533	34	33	36	43	Please, a group of references have more than 10 years, and the scientific results has advanced very much in this time. [Cristobal Felix Diaz Morejon, Cuba]	Accepted: we added more recent references.
11855	34	30	44	19	There is a strong bias towards Africa, with little or no examples or assessment of other regions (e.g., central Africa, the Middle East) in this section and its subsections. The assessment needs to be more balanced and inclusive; alternatively it needs to be explained why some regions are excluded. Even if literature is sparse on some regions it needs to be assessed here. [Hans Poertner and WGII TSU, Germany]	Accepted: we add references the other continents. For example in teh wildlife section: Conversely, shrub encroachment may buffer desertification by increasing resource and microclimate availability, resulting in an increase in vertebrate species abundance and richness observed in the shrub encroached arid grasslands of North America (Whitford 1997) and Australia (Parsons et al., 2017)
11853	34	5			"that" should be "which" here, otherwise the meaning of the sentence becomes obscured [Hans Poertner and WGII TSU, Germany]	Rejected. "that" does not appear in this paragraph. No change made
24917	34	20			However this assertion was recently contradicted by the meta analysis from Li et al. (2016) showing that the soil C sequestration in encroached grasslands is related to the rainfall. In all cases, shrub encroachment is considered as a land degradation process even it is storing carbon in soils. [Pascal Podwojewski, France]	Noted. Li et al (2006) examines ony soil carbon stocks. They do not consider changes in the vegetation carbon stocks which can be very large in the cases of shrub encroachment and fire. This reference is added to the statement concerning below-ground carbon stocks.
24919	34	20			Li, H., Shen, H., Chen, L., Liu, T., Hu, H., Zhao, X., Zhou, L., Zhang, P. and Fang, J. (2016). Effects of shrub encroachment on soil organic carbon in global grasslands. Scientific reports, 6. DOI: 10.1038/srep28974 [Pascal Podwojewski, France]	Noted. Li et al (2006) examines ony soil carbon stocks. They do not consider changes in the vegetation carbon stocks which can be very large in the cases of shrub encroachment and fire. This reference is added to the statement concerning below-ground carbon stocks.
3609	34	30			reconsider Title: make similar to title above: 'Desertification feedbacks to Natural and socio-economic systems under CC'. This makes it easier for the reader to follow the line of arguments. [Cordula Ott, Switzerland]	We have changed the title as "Desertification Impacts on Natural and Socio-Economic Systems under Climate Change."
26639	35	1	35	3	From the published abstract, the Homewood reference doesn't bear out the point being made. My impression is that shifts from cattle to small ruminant production in East Africa are explained primarily by market demand rather than climate change or variability [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	accepted : But in the publication, the authors show that all indicators, rangeland degradation, drought, demography and, as you say, the market conditions have contributed to the change in typology of livestock

Comment No	From Page	From Line	To Page	To Line	Comment	Response
5779	35	3	35	3	increase is better than change here! [Sanaz Moghim, Iran]	accepted: change was changed by increase.
31739	35	9	35	9	Is this text on humid and temperate temparature chaange relevant to desrtification? [Elizabeth Migongo-Bake, Kenya]	accepted: we deleted this sentence: “Warm and humid conditions causing 9 heat stress increase livestock mortality (Howden et al., 2008).”
26641	35	11	35	14	This sentence appears to be out of place [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Answer: accepted: this sentence was changed of paragraph.
11861	35	13	35	14	How is this example related to wildlife? [Hans Poertner and WGII TSU, Germany]	Rejected: this example are related with water availability: “In addition, the ecosystem water availability is negatively affected by the combination of drought with increments in temperature at the late 20th and early 21st centuries; for example, Woodhouse et al. (2010) estimated a reduction from 2-8% of the Colorado river runoff for each 1°C increment of temperature. (Page 35 L11-14).
39121	35	15	35	20	Do reductions in SOC and organic matter inputs lead to intensive grazing? [, United States of America]	accepted: we deleted this sentence: “and intensive grazing (Sharkhuu et al., 2016)”
26583	35	24	35	24	Did Yang et al 2016 estimate an uncertainty on the estimate of 3.5 GtC yr-1 that could be sequestered by the "degraded woodlands, grassland and desert of the world'? [Yves Balkanski, France]	Yang et al. (2016) did not estimate an uncertainty on the estimate of C sequestration.
39123	35	28	35	28	Presumably should be 'lower annual rainfall totals'. [, United States of America]	accepted: be changed by “Lower annual rainfall”
245	35	32	35	32	Recommend an additional sentence: “Under even drier conditions, photodegradation of vegetation biomass may often constitute an additional loss of C from ecosystems.” (citation: Rutledge S, Campbell DI, Baldocchi D, Schipper LA (2010) Photodegradation leads to increased carbon dioxide losses from terrestrial organic matter. Global Change Biology, 16, 3065–3074, doi: 10.1111/j.1365-2486.2009.02149.x.) [Matthew Petrie, United States of America]	accepted: this sentence was added as reviewer suggested.
39125	35	38	35	38	Not sure 'drier' is a correct reading of Donat et al. Perhaps 'warmer with an increasing frequency of extreme events' [, United States of America]	accepted: drier was changed by warmer with an increasing frequency of extreme events
32267	35	40	35	40	25% cover could be measured many different ways and "biological signficance" is vague; this is not general. I would strike [Nicholas Webb, United States of America]	accepted: we deleted “below 25% (threshold that has a biological significance)”
31705	35	41	35	41	delete "would" [Elizabeth Migongo-Bake, Kenya]	accepted: would was deleted.
497	35	42	35	42	It would be more correct to write "erosive winds have no more obstacles, which favor the occurrence of wind erosion and dust storms". [Beatrice Marticorena, France]	accepted the change in this sentence suggested by reviewer.
499	35	44	35	44	The reference is absolutely not relevant for this sentence. The paper by Penate et al., 2013 is not about the impact of dust on soil loss or loss of nutrients. [Beatrice Marticorena, France]	Accepted: this reference was changed by: Goudie and Middleton (2001; Earth Sci. Rev) and Middleton (2017; Aeolian Research)
6621	35	13			Erase parenthesis [, Mexico]	Answer: accepted the parenthesis was deleted.
24921	35	22			In arid areas, sandy soils cover large surfaces. These soils are not sequestrating high amounts of carbon. The increase of sustainable productivity will increase the above ground biomass; it is the only way to increase the carbon sequestration in these soils. [Pascal Podwojewski, France]	Thank you. We have checked your comment, but we think that the sentence of lines 20-22 are supported for published paper by Lui et al. 2011.
8719	36	1	36	15	Desertification can be seen in relation with production and consumption patterns- SDG 11. Increasing needs of the population are generating unsustainable supply and demands in the supply chain. For reversing the effects of desertification SDG 17 - partnerships has an important role to play, too. [Mihaela Stefanescu, Romania]	Noted, after assessing the related literature on SDG11 we came to conclusion to increase the associated magnitude. We could not find evidence from the literature evaluating the impact of desertification under climate change on the attainment of SDG 17.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11863	36	8	36	44	The length of this section and subsections has reduced much since previous drafts Please cross-link with other sections on biodiversity within this chapter to emphasise that there is, indeed, more information. [Hans Poertner and WGII TSU, Germany]	Accepted: we added cross-referencing between section of this chapter: Page 34 L41 to page 35L1: For example, changes in composition of plant communities, as well as decreasing of plant species richness in some regions of Africa as mentioned in the 3.3.1.2. section. Additionally, shrub encroachment as also reported for Africa North America and Australia (3.4.3.). P35 L11: The future projection of impacts on provision services of ecosystems is presented later on in the section 3.6.2. P35 L44-45: Thereby, the soil formation as a supporting ecosystem service is negatively affected (section 3.4.1.). P36 L29: The future projection of impacts on plant biodiversity is presented later on in the section 3.6.2.
11865	36	8	36	44	Section is biased towards Africa. Please present more balanced information [Hans Poertner and WGII TSU, Germany]	Accepted: L31-36: We have included a more global perspective of the impact of desertification on wildlife.
32085	36	25	36	25	Xeromorphic [Stephen Prince, United States of America]	accepted: xeromorphistic was changed by xeromorphic
11867	36	30	36	44	This section is great, but why has it become so short and why is there so little information presented here? If not more is available that is adequate for this report, please state so. Otherwise, please also include information on, e.g., climate change/desertification and wildlife in central Asia, central/South America, etc.; and will desertification also lead to a reduction in available microclimates, or a change in disease transmission among wildlife? [Hans Poertner and WGII TSU, Germany]	Accepted: This section was reduced following recommendations in the previous review. As requested, we have added information on microclimates, disease transmission and desertification in Asia, America and Australia.
32087	36	35	36	35	Teleology! Replace "...to conserve..." with "that conserves" [Stephen Prince, United States of America]	accepted: to conserve was changed by that conserves
3629	36		44		summary of comments above: strive for coherence in titles: for example: always use 'Desertification and…'. This is helpful for readers [Cordula Ott, Switzerland]	Accepted. We used consistent titles.
15127	36	9		29	It should be added also the erosion of cultural biodiversity due to the abandonment of local varieties for the benefit of so-called "improved" varieties in the context of adaptation measures [Ibouraïma Yabi, Benin]	Accepted: We add this paragraph: In Africa, the development of more drought-tolerant varieties of plant species is a strategy for adaptation of populations to the shortening of the rainy season, but leads to a loss of local varieties and therefore of cultural biodiversity (Al Hamndou and Requier-Desjardins, 2008)
32091	37	1	37	1	3 [Stephen Prince, United States of America]	Unfortunately, comment is not clear.
39127	37	3	37	4	Should be 'impacts on agricultural productivity and pastoral livelihoods'. [, United States of America]	Rejected, not related to cited page and line numbers.
25187	37	4	37	4	SDGs, if abbreviation is introduced on page 14, line 31 [Alexander Erlewein, Germany]	Accepted, modified.
32089	37	4	37	4	SDGs needs a citation - and maybe attribution (United Nations - NOT UNCCD) [Stephen Prince, United States of America]	Accepted, done.
3827	37	8	37	12	Replace " the combination of pressures coming from climate change and desertification will amplify, in interaction with other contextual factors, poverty, food and nutritional insecurity, disease burden, lack of access to water and sanitation, and the likelihood of conflict (Sections 3.5.2.1 – 3.5.2.7). " By " the combination of pressures coming from climate change and desertification will amplify, in interaction with population density and other contextual factors, poverty, food and nutritional insecurity, disease burden, lack of access to water and sanitation, and the likelihood of conflict (Sections 3.5.2.1 – 3.5.2.7)." [Philippe Waldteufel, France]	Rejected, population growth is assumed under other contextual factors.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
1825	37	11	37	11	I understand Fig. 3.9 introduces the SDGs; perhaps the authors could include a reference to this in the text, when discussing various SDGs. [William Lahoz, Norway]	Noted, since the paragraphs were structured around SDGs, they could be traced directly to each Goal.
7053	37	15	37	16	Since this is a qualitative assessment, how should your reader understand what is implied by magnitude in Fig 3.9 and how did you arrive at this? [Debra Roberts, South Africa]	Accepted, explained. We indicated that this is a qualitative assessment of the authors, and we indicated different levels of magnitude.
4147	37	15	37	16	Please, improve the quality/resolution for figure 3.9 [Eugenia Gayo, Chile]	Accepted, done.
4149	37	15	37	16	Figure 3.9: It´s a little subjective how the magnitude of impacts is depicted on the side of each box and presented in its corresponding legend. It´s necessary to provide a relative scale for the magnitude as used for representing levels of confidence. [Eugenia Gayo, Chile]	Accepted, provided.
39129	37	16	37	16	For Figure 3.9, reverse the confidence bar (put dark brown on the right). Typically magnitude increases to the right, and easy to interpret dark brown as uncertain on first read. [, United States of America]	Accepted, done.
39131	37	19	37	19	Update with new SOFI 2018 number (821 million), and mention acknowledged role that climate impacts in dryland areas has played in recent increases (http://www.fao.org/3/I9553EN/i9553en.pdf). [, United States of America]	Accepted, done.
41535	37		37		Please put the reference(s) or if authors construction [Cristobal Felix Diaz Morejon, Cuba]	Noted, this is authors construction so no reference is given.
32095	37	1	44	20	Much of this section has only a tenuous connection with climate. There is detail (some of it repeating IPBES LDRA) often followed by a statement that amounts to "climate might affect this". Considerable space could be saved by citing sources and restricting comment to only significant climate effects. [Stephen Prince, United States of America]	Rejected. Thank you for your perspective. All these socio-economic aspects are crucial elements of joint impacts of desertification and climate change, it would be wrong to limit those only to biophysical processes. Moroever, assessment of socio-economic impacts is mandated by the scoping. Thirdly, since this chapter and relevant chapters in the IPBES LDRA are assessing the same sources of literature, it is not surprising that we are sometimes discussing similar topics. We would rather see it in a very positive light, especially on many points when two independent assessments are coming to similar conclusions, strengthening each other.
24825	37	18	44	19	Section 3.5.2 on Socio-economic systems, cross reference with the chapter on food security (see page 31 in Ch5 line 39 section 5.2.4 for consistency). That chapter also treats how climate change affects food security, nutrition, etc. [Justice Issah Musah Surugu, Germany]	Accepted, links provided. We do not elaborate on these in much detail here exactly because Chapter 5 is focused on them.
3611	37	18			Impacts on Food and Nutrition availability (= use same wording in all subchapters) or delete 'Impacts' in all titles; …. or other form of coherence in titles throughout this subchapters: like Desertification and F ood and Nutrition Insecurity [Cordula Ott, Switzerland]	Accepted, done. We kept Gender-differentiated impacts, as leaving Gender alone as title would be confusing.
23571	37				The content shown in the picture in Figure 3.9 is not clear, the word is not clear [Huai Jianjun, China]	Accepted, clarified.
3797	38	17	38	25	Available underground water could be a potential source for irrigation [Mustafa Elhag, Sudan]	Noted, since this is a response, we discuss this under Section 3.7.3.2
39133	38	23	38	23	Could add "Recent assessments (FAO 2018) have noted that climate variability combined with a lack of climate resilence has contributed to substantial increases in food insecurity in dryland areas." [, United States of America]	Accepted, added.
25211	38	31	38	31	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, modified.
7055	38	35	38	40	Is it possible to provide the global and regional details before the information on specific countries? [Debra Roberts, South Africa]	Accepted, done.
11871	38	42	38	44	This statement should provide a link to appropriate sections in SRCCL Chapter 4 [Hans Poertner and WGII TSU, Germany]	Accepted, done.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39135	38	45	38	45	Should be 'agricultural and pastoral productivity'. Many dryland households also rely on livestock. [, United States of America]	Rejected, agriculture includes both crop and livestock production.
6623	38	6			Erase the parenthesis after 2017 [, Mexico]	Acccepted, done.
11869	38	6			Please specify where in Chapter 5 this information can be found [Hans Poertner and WGII TSU, Germany]	Accepted, specific Section in Chapter 5 referred to.
3613	38	25			Impacts on wealth and poverty ((= use same wording in all subchapters) or delete 'Impacts' in all titles; …. or other form of coherence in titles throughout this subchapters: like Desertification and Poverty [Cordula Ott, Switzerland]	Accepted, done.
39137	39	6	39	7	These increases in poverty rates for Malawi and Tanzania seem suspiciously high. The reference couldn't be accessed: http://hss.ulb.uni-39bonn.de/2016/4355/4355.pdf. [, United States of America]	Noted, this sentence does not mean increased poverty rates in a country by so much, but increased the probability of a household falling below poverty line. Clarified. The link is refreshed.
41537	39	8	39	13	Please may you to explain more, or seek other references about this theme because isn´t clear. [Cristobal Felix Diaz Morejon, Cuba]	Accepted, clarified.
21779	39	16	39	27	is population growth, both in the pastoralist communities as well as in crop agriculture communities (competing for the same land) not also core to these problems? [Graham von Maltitz, South Africa]	There is no direct reference to population growth in this section only descibing the literature backed facts that crop culture is crowding out pastoral systems
39139	39	18	39	18	Perhaps the authors meant Sahelian droughts of the 1980s? The Sahel was wet in the 1960s. [, United States of America]	Noted, the Sahelian drought started since the late 1960s according to the references given, we changed to 1970-80s to show the most impacted period.
21781	39	28	39	28	Pastoralists are said to have weak adaptive capacity, yet in page 12 13-32 a lot is made about the high resilience of these groups. There seems to be possible contradictions. [Graham von Maltitz, South Africa]	Rejected. On page 12 dryland populations including pastoralists are described as vulnerable groups to climate change. There is no lack of consistency
11875	39	28	39	36	Please clarify whether the information in this paragraph applies globally [Hans Poertner and WGII TSU, Germany]	Noted, Yes, good number of references are cited in this section to demostrate that this is the case. Added globally.
11873	39	15	40	6	This section is exclusively on saharan Africa - what about pastoral communities in other regions, e.g. southern Africa, central Asia, [Hans Poertner and WGII TSU, Germany]	Noted. the section elaborates about pastoral systems in general only some examples are from Africa, added more exampls from outside Africa.
24827	39	15	40	6	Focusing on them alone exposes the authors to selection bias which may not be defendable. I suggest the section is completely removed or integrated with the poverty section. Most of the issues discussed therein have been covered in the poverty section, [Justice Issah Musah Surugu, Germany]	Rejected. Pastoral communities are a major most vulnerable group, for this reasn treated separately.
26643	39	28	40	6	Lopez-i-Gelats et al. 2016, already cited elsewhere, could usefully be cited here. Encroachment on pastoral rangelands (specifically riverine dry-season grazing) is covered by Roy Behnke and Carol Kerven, Replacing Pastoralism with Irrigated Agriculture in the Awash Valley, North-Eastern Ethiopia: Counting the Costs in Catley, Lind and Scoones, Pastoralism and Development in Africa, Routledge (2013). It would be useful to include a reference to pastoralists becoming dependent on food aid, or petty urban employment, or extractive activities such as charcoal production. Catley et al's introduction to the same volume is one reference for this. [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, included the reference. The ideas that pastoral livelihoods are threatened are already highlighted.
3799	39	48	40	7	community forests should be encouraged [Mustafa Elhag, Sudan]	Accepted, community forest management is discussed in 3.7.3.
3615	39	15			Impacts on Pastoral Communities (= use same wording in all subchapters) or delete 'Impacts' in all titles; …. or other form of coherence in titles throughout this subchapters: like Desertification and Pastoral Communities [Cordula Ott, Switzerland]	Accepted, done.
501	40	1	40	6	What about the developement of mixed system with catteling associated to cropping which is clearly mentionned in Chapter 4 ? [Beatrice Marticorena, France]	Noted. That is what agro-pastoral system is all about, mixed crop farming and livestock herding. It is covered/captured extensively in the whole report

Comment No	From Page	From Line	To Page	To Line	Comment	Response
18307	40	8	40	19	It seems that the role of the impact of climate change in combination with other desertification processes on water scarcity and their use in arid regions in this section is willingly or unwittingly underestimated. In some regions, its consequences for water resources and, accordingly, for the socio-economic sphere can be catastrophic. In recent history there are examples of events of this kind. For example, in the end of the 20s of the last century, in the province of Inner Mongolia in China, against the background of increasing arid climate, one of the worse in the region history severe drought has happened (Zheng et al., 2018). This event also affected a vast region in the Upper Amur River Basin, which led to a decrease in the runoff of this entire big river to a minimum over a 110-year period. There are estimates that the desiccation of Central Asia causes a noticeable decrease in the water inflow to Baikal Lake. [Anatoliy Mandych, Russian Federation]	Noted, our assessment is consistent with your statement. In some regions there is high confidence that climate change will exacerbate water scarcity and droughts, but this does not equally apply to all drylands. For this reason, we use "medium confidence" when we talk about drylands in general.
18309	40	8	40	19	Zheng, J., Yu, Y., Zhang, X., and Hao, Z.: Variation of extreme drought and flood in North China revealed by document-based seasonal precipitation reconstruction for the past 300 years, Clim. Past, 14, 1135-1145, https://doi.org/10.5194/cp-14-1135-2018, 2018. [Anatoliy Mandych, Russian Federation]	Accepted, included.
25059	40	8	40	19	There are two types of water scarcity: quantity-induced water scarcity and quality-induced water scarcity (Liu et al., 2016; Liu et al., 2017). It is not clear how desertification influence each type of water scarcity. For example, the first sentence shows reduced water retention capacity amplifies floods, but this can increase water availability, and it is confusing why it leads to “exacerbating existing water scarcities”. Salinisation may trigger quality-induced water scarcity, and it’s better to mention the two types of water scarcity explicitly. 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. There are two types of water scarcity: quantity-induced water scarcity and quality-induced water scarcity (Liu et al., 2016; Liu et al., 2017). It is not clear how desertification influence each type of water scarcity. For example, the first sentence shows reduced water retention capacity amplifies floods, but this can increase water availability, and it is confusing why it leads to “exacerbating existing water scarcities”. Salinisation may trigger quality-induced water scarcity, and it’s better to mention the two types of water scarcity explicitly. 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]	There are several comments here. First, the suggestion that floods increase water availability is rejected. If degradaton reduces soil water holding capacity and this leads to floods, it does not mean that there is more water available, it means that instead of smoother availabiltiy of water over time (e,g, through recharging aquifers), there is too much water at one specific point, and higher water scarcity at the rest of the period. Second, about two types of water scarcity, accepted. We included a statement that water scarcity effect would work both through water quality and quantity. Third, suggested references, accepted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14681	40	13	40	15	It might be useful here or elsewhere in the report to briefly highlight the recognized impacts of drought on human health. (See Yusa, A., Berry, P., Cheng, J. J., Ogden, N., Bonsal, B., Stewart, R., Waldick R. (2015). Climate change, drought and human health in Canada. Int J Environ Res Public Health, 12(7), 8359-412. DOI: 10.3390/ijerph120708359. http://www.ncbi.nlm.nih.gov/pubmed/26193300) [, Canada]	Accepted, included in the cross-chapter box on drought policy responses.
31707	40	16	40	18	While the title of this section is "Impacts of water scarcity and Use", This is the ony place water use in use and only in relation to waste Wter use. Should the title then not reflect this by by renaming it "Impacts of water scarcity and waste water use" ? [Elizabeth Migongo-Bake, Kenya]	Rejected, the use marginal quality waters is part of water use. Moreover, we discuss wider issues related to water use, e.g. water used for leaching, so we do not see a contradiction by keeping water use in the title.
22551	40	16	40	19	"The use of untreated wastewater is likely to exacerbate desertification processes" This iseems to be rather far fetched. The linkage would have been been better with SDG 3 (Good Health and well being) and 6 (Clean water and Sanitation). [Anastasios Kentarchos, Belgium]	Several comments here. First, by desertification we mean all forms of land degradation in drylands, there is ample evidence showing that use of untreated waste water and marginal-quality waters contributes to soil degradation, so the suggestion that this link is far-fetched is rejected. Second, highlighting the link to SDG 3 is accepted. Links to SDG 6 here are more indirect (here we are talking about impacts, rather than responses), bringing this in we feel will widen the focus too much beyond the intended scope of this paragraph, so this is rejected.
32521	40	22	40	29	Except physiological differences, many social and behavioral differences between men and women are socially constructed by existing social norms andcultural and sometimes religious traditions. This paragraph indicates that the differentiated impact of climate change on women and men are due to the difference between them. This masks the social and structural inequalities which are at the root cause of these differences and hence resulting in differentiated impact of climate change. After reviewing the citations, it will be more appropriate to reframe the paragraph as follows: "Environmental issues such as desertification and impacts of climate change have been increasingly investigated through a gender lens [text deleted] (Bose, 2015; Broeckhoven and Cliquet, 2015; Kaijser and Kronsell, 2014; Kiptot et al., 2014; Villamor and van Noordwijk, 2016). [text deleted] Socially constructed gender-specific roles and responsibilities, daily activities, access and control over resources, decision making and opportunities [text deleted] lead men and women to interact differently with natural resources and landscapes. However, it is recognised that women will be impacted differently than men by environmental degradation (Arora-Jonsson, 2011; Gurung et al., 2006)." [Hanna Paulose, United States of America]	Accepted, included.
32523	40	25	40	25	Socially constructed gender specific roles. . .' would be better suited in this sentence and other instances where applicable. [Hanna Paulose, United States of America]	Accepted, included.
11879	40	27	40	29	A cross-link to Chapter 4 would be appropriate here [Hans Poertner and WGII TSU, Germany]	Accepted, included.
32525	40	30	40	30	"Despite these known differences between men and women" is not an appropritate framing for reasons outlined in comment No 2. Could be rephrased as follows: "Despite growing evidence pointing to differentiated impact of environmental degradation on women and men. . ." [Hanna Paulose, United States of America]	Accepted, included.
5781	40	30	40	33	I believe one of the main reasons is culture and rules in the countries particularly in developing countries that can be important! Good to mention it. [Sanaz Moghim, Iran]	Noted, our previous sentence maks this point generally We added an example from a dedeveloping country setting to further explain this.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
22553	40	31	40	31	The use of the "conservation efforts" is unclear. [Anastasios Kentarchos, Belgium]	Accepted, clarified.
31709	40	32	40	33	This is not really true and we have moved beyond tte rhetoric of saying " Assessments of the gender dimension of desertification and climate change impacts are still very scarce, particularly at the macro or landscape level" and several examples exixst to negate this statement for land degradation/desertification, climate change and gender equality 1. Biodiversity Loss and Climate Change: Gender Issues in ... - jstor www.jstor.org/stable/10.11116/jdivegendstud.1.2.0023 by N Broeckhoven - 2014 - Related articles This essay aims to reduce a gap in the literature by providing an up-to- ... change. First, the linkages between gender issues and the environment are put into ... “gendered” impacts of environmental degradation (or impacts of environmental .... women, in efforts to combat desertification and mitigate the effects of drought. In. 2. [PDF]gender-responsive land degradation neutrality - unccd https://knowledge.unccd.int/.../3.%20Gender-sponsive%2BLDN__A_M__Samanda... by AM Samandari - 2017 - Cited by 1 3 Jun 2018 - gender an appropriate way to examine the relationship between land degradation and equality of the sexes.8 Law plays a crucial ... Nations Convention to Combat Desertification (UNCCD) refers to “a ... Section II will present findings in the literature ... climate change, gender and land degradation. Section ... and 3. [PDF]environmental change, land resources management & gender in rural ... etheses.bham.ac.uk/5964/1/Baba15PhD.pdf by SU Baba - 2015 - Cited by 1 - Related articles The research examines the way gender relations affect land management and the perception ... government considers desertification and land degradation to be the main ..... vironment (including biodiversity and climate change) and all three are .... linkages between ecological and social issues and focus not only on the ... WomenWatch: Women, Gender Equality and Climate Change - UN.org www.un.org/womenwatch/feature/climate_change/factsheet.html Jump to Women, gender equality and changes in human settlements and ... - Climate change adds a new complexity to ... Similarly, desertification distressing the ... a direct link to their socioeconomic status, to ... UN publications:. [PDF]Special Report on climate change, desertification, land degradation ...	Accepted, what we meant was lack of studies evaluating the impact of land restoration/rehabilitation activities and policies on gender equality, many of which remain gender-blind.
24831	40	32	40	33	It contradicts line 22-24 on the same page. Line 32-22 says "assessment of gender dimension of desertification and climate change impacts are still very scarce, particularly at the landscape or macro level" . Line 22-24 says "environmental issues such as desertification and impact of climate change have been increasingly investigated through a gender lense...." [Justice Issah Musah Surugu, Germany]	Noted. All studies on the impact of climate change on gender equality are understandably at the household/community/micro levels. What we are saying here is that there are no studies evaluating larger scale, say regional, global, patterns. Local studies have very diverse results on the extent how climate change will affect gender equality, meaning that the specific impacts will strongly vary from place to place.
39141	40	35	40	44	The broad brush used to categorize all of the Africa and SE Asia gender studies seems poorly nuanced. [, United States of America]	Accepted, deleted.
2839	40	36	40	40	I would suggest changing these 2 sentences in the following way: "Women, who are primary natural resource managers and providers of food security in the region, are often expected to fetch water and to collect fuelwood from increasingly remote areas (Mekonnen et al., 2017; Scheurlen, 2015), whereas men migrate to nearby towns or other countries for better opportunities, leaving women behind with more responsibilities." [Bettina Weber, Germany]	Accepted, included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
24829	40	21	41	7	Section 3.5.2.5 deals with gender diffenriated impacts. The chapter is good, however, the whole section failed to provide clear evidence on how desertification challenges pre-existing socio-ecological norms. The authors should provide clear evidence of what the pre-existing norms / gender roles have been, and how desertification is changing these and the resulting impacts of these desertification and climate-related changes. So for example, say women in a given culture didn't have access to land. With desertification and climate, is land access affected? are women worse off without access to land (e.g. nothing changed in land access? true/not true?). More evidence and clarity here would be really helpful. [Justice Issah Musah Surugu, Germany]	Noted. We did not indicate that desertification changes pre-existing socio-ecological norms. This section shows that desertification impacts women more than men BECAUSE OF pre-existing social norms, and we provided evidence for this. Later in Section on policy responses, we discuss on women empowerment as a response to desertification under changing climate.
3617	40	8			Impacts on Water Availability and Use (= use same wording in all subchapters) or delete 'Impacts' in all titles; …. or other form of coherence in titles throughout this subchapters: like Desertification and Water Scarcity and Use [Cordula Ott, Switzerland]	Accepted, done.
11877	40	15			Please cite this Report more clearly: clarify that this is AR5 WGI, Chapter xxx, Section xxx; provide the author names in brackets as for other references [Hans Poertner and WGII TSU, Germany]	Accepted, done.
3619	40	21			…. or other form of coherence in titles throughout this subchapters: like Desertification and Gender [Cordula Ott, Switzerland]	Noted, we harmonized on all other titles of sub-sections, except Gender. having only Gender as title sounds awkward, Desertifiction is implied in all.
22017	40				Water scarcity …other factors are also essential in the debate …depending on soil types an layer structures, depth and groundwater table level…etc. [Hala Abayazid, Egypt]	Noted, we indicate at this in the first sentence, where we discuss about the role of soil degradation in soil water retention capacity. The purpose of this sub-section is to exactly do this, indicate that land quality and soil health matters for water use.
31713	41	9	41	42	Access to water for livestock is a crucial resource driving conflict in drylands especially in the dry season and periods of drought . This has been missed out and and needs inclusion here and with the relevant references. [Elizabeth Migongo-Bake, Kenya]	Accepted, included.
28609	41	9	41	42	The section does not clarify what is meant by conflict. It remains unclear whether violent conflicts or non-violent disputes are covered or both. This is important as general "conflicts of interest" can be seen as part of regularl interactions in society, whether the use of violence is detrimental. Adding a section on conflict to the glossary and/or clarifying its use in this section is advisable for increasing clarity. [Nina von Uexkull, Sweden]	Accepted, we discuss violent conflict, clarified.
28613	41	9	41	42	Recent literature on climate change and armed conflict finds more evidence for an effect on ongoing conflict. Theisen, Ole Magnus. 2017. “Climate Change and Violence: Insights from Political Science.” Current Climate Change Reports 3 (4): 210–21. https://doi.org/10.1007/s40641-017-0079-5. von Uexkull, Nina, Mihai Croicu, Hanne Fjelde, and Halvard Buhaug. 2016. “Civil Conflict Sensitivity to Growing-Season Drought.” Proceedings of the National Academy of Sciences 113 (44): 12391–96. https://doi.org/10.1073/pnas.1607542113. It is also clear that violence decreases the capacity of local populations to adapt to climate change and natural hazards, which may be a reason behind the more significant effects on conflict dynamics and severity (e.g. Wischnath, Gerdis, and Halvard Buhaug. 2014. “Rice or Riots: On Food Production and Conflict Severity across India.” Political Geography 43 (0): 6–15. https://doi.org/10.1016/j.polgeo.2014.07.004.). The detrimental role of conflict on adaptation makes conflict itself an important contextual factor that would be important to mention in lines 38-42. [Nina von Uexkull, Sweden]	Accepted, included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
881	41	10	41	42	Climate change and desertification was not a factor to explain conflicts in the cases studied by Benjaminsen et al (2012) contrary t what is claimed here. That was actually one of the main conclusions of the whole study, that climate change did not play a significant role in explaining the conflicts studied in central Mali. Furthermore, the claim that there is high confidence in climate change and desertification add to overall conflict potential is highly questinable, at least when it comes to desertification. Uncertainties remain whe it comes to the role of cliamte change. And if you refer to the work of Hsiang and colleagues you should also refer to the critique of this work by Buhaug and his colleagues (e.g. https://link.springer.com/article/10.1007/s10584-014-1266-1). [Tor A. Benjaminsen, Norway]	Two comments here: 1) Noted, we did not claim here that Benjaminson et al 2012 linked conflict to climate change, we indicated that this paper highlighted competition between crop producer and pastoralists, an already existing factor with which desertification and climate change will interact. Moreover, later in the pragraph we explicitly indicated that indeed Benjaminson et al 2012 showed little role of climate for causing conflicts, which were mostly due to corruption and rent-seeking. To avoid misunderstanding, we dropped reference to Benjaminson et al (2012) in this sentence, but kept the later more explicit citation. 2) Accepted, we nuanced the language accordingly, and also referred to Buhaug papers.
8149	41	12	41	13	"The related triggers of conflicts, to which desertification and climate change feed, are higher food price." I believe this is not because of higher food price but rather low purchasing power [Haruni Krisnawati, Indonesia]	Rejected, not supported by providing related literature. on the other hand, There is a lot of literature showing the link between climate change and food production, food production and food prices, food prices and conflicts, food riots.
31711	41	15	41	15	Replace coma after" ... 2017)" with "and", as only two triggers of conflict are stated in the sentence. [Elizabeth Migongo-Bake, Kenya]	Accepted, done.
28615	41	16	41	17	The sentence reads currently "high confidence that climate change do not cause conflict…but add to the overall conflict potential". While I think this is true that there is high agreeement about the fist part of the sentence, I would not agree that there is high confidence or high agreement and evidence on the latter part "conflict potential". Findings in the literature is mixed, especally for new conflicts arising, suggesting these linkages occurr only under very specific circumstances.This can be clarified by deleting the latter part of the sentence or further qualifying it, by stating "can or may contribute." [Nina von Uexkull, Sweden]	Accepted, done.
5783	41	16	41	17	I disagree to say this sentence with "high confidence"! [Sanaz Moghim, Iran]	Rejected, no supporting literature provided.
28611	41	22	41	22	The meta-study by Hsiang et al. (2013) is both somewhat outdated and disputed. The specific numbers cited in the report are therefore unlikely to be accurate. For a commentary see : Buhaug, Halvard, J. Nordkvelle, T. Bernauer, T. Böhmelt, M. Brzoska, J.W. Busby, A. Ciccone, et al. 2014. “One Effect to Rule Them All? A Comment on Climate and Conflict.” Climatic Change 127 (3–4): 391–97. https://doi.org/10.1007/s10584-014-1266-1. [Nina von Uexkull, Sweden]	Accepted, done.
41543	41	24	41	28	I suggest to delete because the Sirian conflict is more complicate that a simple drought, the geopolitic aspects are first. [Cristobal Felix Diaz Morejon, Cuba]	Acceoted, we dropped this to save on space, as it was providing another example to the points we made already, and not adding new information.
40587	41		41		3.5.2.6 : conflict. Check coherency with AR5, SR15, and across chapters. Some sentences, taken out of context, may easily be challenged. This section needs to be checked carefully. [Valerie Masson-Delmotte, France]	Accepted, done.
3621	41	9			…. or other form of coherence in titles throughout this subchapters: like Desertification and Conflicts [Cordula Ott, Switzerland]	Accepted, done.
11881	41	25			Indicate which drought, i.e., during which years? [Hans Poertner and WGII TSU, Germany]	Noted, that sentence was dropped following comment 41543.
7357	42	1	42	33	This part needs some info about the conflicts in Syria where land degradation/drought is one of the driver of migration of millions of people other than poltics [Erhan Akca, Turkey]	A sentence on environmentaly-induced migration and conflict is added based on Kelly et al. (2015) paper on Syria.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26645	42	1	42	33	I like this section - it presents a nuanced, multi-causal view of migration very well. However, I think some linkage should be made with the discussion of migration in 3.7.2.2, and the methodological issues of seeing migration as both an impact of and a response to desertification [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted. A sentence on the impact of migration on land degradation as well as relevant references were added at the end of the paragraph. A reference on urbanisation as one of the impacts of environmentally-induced migration, described more in detail in section 3.7.2.2, is made as a link between the two sections.
39143	42	2	42	7	If the writing team wants to question the WB 2018 report, numerous references should be added to the first sentence justifying the "high agreement". [, United States of America]	Noted. The aim of this section is to provide a nuanced view of the environmental and climate change - migration nexus. It is acknowledged that the new modelling efforts are a great improvement over the early literature, and this relates to the WB estimates too. The projections of increased migration as a result of environmental change are not questioned; however, it is suggested that the precise quantitative estimates should be interpreted with caution as they have (still) several flaws, i.e. are based on the exposure and not the actual individual response, do not take into account agency and adaptation. Of course, it is methodologically difficult to account for these factors in macro-level estimates; therefore, in what follows, more emphasis is put on micro-level evidence which presents more complex and less deterministic perspective. While, of course, more literature could be represented to better reflect the current state of the art if space permitted, we believe that enough references are included to back up the statement, and especially the nuanced view it represents.
22555	42	2	42	14	" the asylum applications to the European Union will increase by 28% up to 188% depending on the climate scenario". Immigration of people from Subsaharan Africa and Middle East is due to multiple complex factors. If this single-source citation is to be retained. [Anastasios Kentarchos, Belgium]	Accepted. The multiple drivers of migration flows are acknowledged in lines 15 and 16 based on the micro-evidence. Note that the estimates by Missirian and Schlenker (2017) focus only on asylum seekers, not all the migrants. To make it clear to the readers, such narrow focus was specified at the beginnign of the sentence. Also, it is now specified that these estimates should be interpreted as "ceteris paribus". Additionally, the section follwing Missirian and Schlenker (2017) reference, emphasizes that caution is needed with interpretation of these marco-level predictions.
1827	42	8	42	9	What do the figures about asylum applications (28%, 188%) represent? It is not clear to what baseline the percentage refers to. [William Lahoz, Norway]	Accepted. Actual figures of estimated additional asylum applications per year were added in brackets.
31715	42	28	42	31	consider adding "drivers" after land degradation to qualify "what" "environmental and land degradation" in the sentence [Elizabeth Migongo-Bake, Kenya]	Rejected. Adding "drivers" after "land degradation" would be misleading, i.e. it would suggest "drivers of land degradation" rather than "environmental drivers of migration" which we have in mind.
32093	42	43	42	43	Also human pathogens? [Stephen Prince, United States of America]	Accepted, included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39145	42	7	47	8	So, by saying 'In a similar vein', authors call into question the accuracy of Missirian and Schlenker? But why? [, United States of America]	Noted. The accuracy of Missirian and Schlenker (2017) estimates is not questioned; however, the deterministic approach in the interpretation of results is noted. More specifically, the authors focus on asylum applications, and therefore, by definition, make reference to political persecution or conflict as a primary rationale for mobility, but the link between rising temperatures and conflict or political instability is neither discussed nor analyzed in the paper. Based on the literature on weather shocks and conflict, for example Kelly et al. (2015) on Syria, it seems that such shocks, rather than fuelling conflict directly, may exacerbate existing underlying causes of conflict. In Missirian and Schlenker (2017), such underlying causes of conflict are not considered, i.e. while the authors use destination country and year fixed effects, the underlying causes of conlict in specific countries might be variables that actually change over time. If this is the case, then the future predictions about the number of asylum seekers might not be so straightforward to estimate and will depend on many contextual country-level inputs. Finally, it is not clear why the authors focus on asylum seekers, if two of the three potential mechanisms evoked are economic in nature (decreased yields and GDP as a result of temperature shocks). In this report, there is not enough space to review individual articles in detail, therefore, the general comment below this reference applies. Despite these flaws, Missirian and Schlenker's (2017) estimates are considered an important input into the discussion and therefore included in the report, and this quantification effort is additionally acknowledged. "In a similar vein" was deleted in order not to introduce too negative a perception.
3623	42	1			…. or other form of coherence in titles throughout this subchapters: like Desertification and Migration [Cordula Ott, Switzerland]	Accepted, done.
11883	42	36			"some regions" - list them or provide examples [Hans Poertner and WGII TSU, Germany]	Accepted, done.
505	43	25	43	26	It could be stated that dust is suspected to play a role in the dynamics of the epidemics as shown in Agier et al. (2005), J R Soc Interface 10:20120814; doi:10.1098/rsif.2012.0814. [Beatrice Marticorena, France]	Accepted, included.
503	43	26	43	28	In this context, Sahara could be replaced by North of Africa. Indeed, the population density is very low in the Sahara, which explain why there is not much research on the effect of dust on health [Beatrice Marticorena, France]	Acepted, repalced with teh Sahel and North Africa.
7057	43	30	43	45	What is your assessment of the information presented in this section? What is the projected impact of climate change on infrastructure under low and high emission scenarios? [Debra Roberts, South Africa]	Noted, this is a knowledge gap. There are no studies on how changes in dust stroms under low and high emission scenarios will affect transportation. Available literature does not allow to make assessment statements regarding how climate change will affect transportation infrastructure through dust and sand storms.
39147	43	30	43	45	What is the link between desertification and dust storms? Is there a strong one? Is this section necessary? Showing a link between dust storms and transport is not the same as showing a link between desertification and transports. [, United States of America]	Noted. Desertification leads to conditions that favour the production of dust storms (3.4.1). This link has high confidence. This section covers the impacts these dust storms (which may be caused by desertification) have on transport infrastructure.
3625	43	30			…. or other form of coherence in titles throughout this subchapters: delete 'Impacts on' [Cordula Ott, Switzerland]	Accepted, done.
11885	43	30			Since a lot of this text is about dune movement, perhaps this should be included in the subsection title [Hans Poertner and WGII TSU, Germany]	Accepted, done.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8267	44	2	44	4	Not only solar energy but also wind energy through the intruction dust particles in the wind turbines. [Noureddine Yassaa, Algeria]	Accepted, included.
8277	44	2	44	4	the soiling effects through dust storms are becoming hotspots research topics [Noureddine Yassaa, Algeria]	Noted
39149	44	2	44	19	What is the link between desertification and dust storms? Is there a strong one? Is this section necessary? Showing a link between dust storms and energy infrastructure is not the same as showing a link between desertification and energy infrastructure. [, United States of America]	Noted. Desertification leads to conditions that favour the production of dust storms (3.4.1). This link has high confidence. This section covers the impacts these dust storms (which may be caused by desertification) have on energy infrastructure.
8271	44	4	44	4	Solar radiation is slso affected by dust storms by reducing the intensity. [Noureddine Yassaa, Algeria]	Accepted, included.
8269	44	11	44	11	Please assess more recent papers. For the impacts of dust storms and dust particles on solar energy operation [Noureddine Yassaa, Algeria]	Accepted, added.
8273	44	18	44	19	not only costs but also excessive use of water. [Noureddine Yassaa, Algeria]	Noted, included.
8275	44	18	44	19	Emerging innovations use special coatings on the surface of panels and also emerging of bifacial whcich revents the deposition of dusts. [Noureddine Yassaa, Algeria]	Acepted, included.
39151	44	22	44	22	SRES not defined. [, United States of America]	Accepted. Definition and citation provided
39153	44	27	44	42	But earlier the chapter indicated the Aridity Index was INSUFFICIENT as an indicator of desertification. Page 45 lines 11-20 should probably be moved to page 44. [, United States of America]	Noted, clarified
32097	44	28	44	28	Citations to the parts of this Report that explain RCPs would be useful for the reader of just this part. Perhaps an extensive Glossary of all terms, especially acronyms will be provided? [Stephen Prince, United States of America]	Noted. Acronym is provided at the beginning of section 3.6
24763	44	39	44	39	As studies about changes in types of climate have been mentioned in sec 3.1.1, I suggest to mention here as well studies where changes of type of climate have been verified in climate projections. For example, a sentence like "In CMIP5 scenarios, Mediterranean types of climate are projected to become drier (Alessandri et al 2014; Polade et al 2017), with the equatorward margins likely replaced by arid types of climate (Alessandri et al., 2014)". The references are: "• Alessandri A, De Felice M, Zeng N, Mariotti A, Pan Y, Cherchi A, Lee JY, Wang B, Ha KJ, Ruti P, Artale V (2014) Robust assessment of the expansion and retreat of Mediterranean climate in the 21st century. Sci Rep 4, 7211 doi: 10.1038/srep07211" and "Polade SJ, Gershunov A, Cayan DR, Dettinger MD, Pierce DW (2017) Precipitation in a warming world: assessing projected hydro-climate changes in California and other Mediterranean climate regions. Sci Rep 7 doi 10.1038/s41598-017-11285-y [Annalisa Cherchi, Italy]	Acepted, text included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
1341	44	21	45	32	The new study entitled "Dryland changes under different levels of global warming" by Koutroulis (2019) provide a consistent assessment on the content of the projections of Aridity at the global scale as well as at the watershed scale for 21 major river basins, framed in terms of Global Warming Levels (1.5, 2 and 4oC according to RCP8.5) which are suitable for policy-relevant climate impacts assessments. This study take the opportunity of availability of a new set of higher-resolutions transient climate and impacts simulations that were also supported the findings of the study referenced in the Runoff section of the SR15 and figure 3.15 from the publication (Betts, R.A. et al., 2018). Koutroulis, A. G. "Dryland changes under different levels of global warming." Science of The Total Environment 2019, 655 (2019): 482-511. doi.org/10.1016/j.scitotenv.2018.11.215 Betts, R.A. et al., 2018: Changes in climate extremes, fresh water availability and vulnerability to food insecurity projected at 1.5°C and 2°C global warming with a higher-resolution global climate model. Philisophical Transactions Royal Society A, 376(2119), doi:http://dx.doi.org/10.1098/rsta.2016.0452. [Aristeidis Koutroulis, Greece]	Noted. The Koutroulis et al (2019) study uses the Aridity Index which relies on potential evaporation that is calculated using a method containing assumptions that are not valid if the atmospheric CO2 concentration levels change, as they do in future climate change. This is discussed in section 3.2.1 and 3.3.1. The Betts et al. (2018) paper shows a mix of increases and decreases in water availability (runoff) in dryland catchments. Reference to these papers is added to section 3.6
507	44	22	45	32	In this section, a specific discussion on the projected change in terms of sand and dust storm is needed. This implies to add elements on the expected changes in surface wind speeds and in particular on the occurrence of high surface winds taht can exceed the erosion thresholds. In Chapter 4, some reference from the litterature on wind power developed for aeolian energy purpose are given that could be used here. But there is alo some litterature on the impact of wind speed changes on the evapotranspiration (McVicar et al., 2012) and reseach on the trends of wind speed and dust storms on different regions of the world. [Beatrice Marticorena, France]	Noted. Two papers that investigate future changes in wind erosion/dust emisssion are Wang et al. (2009) and Evan et al. (2016) which are discussed in section 3.6.1. They suggest a decrease in dust emission is probable.
509	44	22	45	32	Several papers discuss the recent trends in aeolien phenomenon occurence in relation with changes in wind speeds in different arid regions of the world (for example Cowie et al., Geophy. Res. Let, 40, 1–5, doi:10.1002/grl.50273, 2013; Ganbat Amgalan, Terr. Atmos. Ocean. Sci., Vol. 28, No. 1, 23-32, February 2017; Kousari et al., Terr. Atmos. Ocean. Sci., Vol. 28, No. 1, 23-32, 2017; Mason et al., Geomorphology, 102, 351–363, 2008). Changes in surface wind speed have been investigated at the global scale (see in particular the synthesis by McVicar et al.,Journal of Hydrology, 2012) but not specifically for the high wind speeds (higher than the erosion thresholds) responsable for wind erosion and sand and dust stroms (see Cowie et al. Geophys. Res. Lett., 42, 8208–8215, doi:10.1002/2015GL065819. 2015; Bergametti et al., Journal of Geophysical Research: Atmospheres, 122. https://doi.org/10.1002/2017JD027471, 2017). [Beatrice Marticorena, France]	Noted. The references given show a relationship between high wind speeds and dust emission. They do not investigate relevant future changes due to global warming. Two papers that do are Wang et al. (2009) and Evan et al. (2016) which are discussed in section 3.6.1. They suggest a decrease in dust emission is probable.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25061	44	22	45	32	The following texts are recommended to add “Park et al. (2018) estimated the timing of significant aridificatoin relative to natural variability, defined as time of emergence for aridification (ToEA), from projections of 27 global climate models (GCMs) under representative concentration pathways (RCPs) RCP4.5 and RCP8.5). The finding showed that aridification emerges over 32% (RCP4.5) and 24%(RCP8.5) of the total land surface before the ensemble median of global mean temperature change reaches 2oC in each scenario. ToEA can be avoided in about two-thirds of the above regions of the maximum global warming level is limited to 1.5 oC, implying the importance of mitigating global warming for controlling desertification.” Park, C. E., Jeong, S.-J., Joshi, M., Osborn, T. J., Ho, C.H., Piao, S., Chen, D., Liu, J., Yang, H., Park, H., Kim, B.M., Feng, S., 2018. Keeping global warming within 1.5ºC restrains emergence of aridification. Nature Climate Change 8, 70–74. [Junguo Liu, China]	Rejected. This reference uses the aridity index which depends on potential evaporation (PET). Here PET is calculated using Penman-Montieth and assumes constant stomatal conductance (in time). However stomatal conductance depends on atmospheric CO2 concentration which changes due to anthropogenic climate change, hence this method is not valid in this climate change context (discussed in section 3.2.1 and 3.3.1). The suggested text is not used.
3627	44	2			…. or other form of coherence in titles throughout this subchapters: delete 'Impacts on' [Cordula Ott, Switzerland]	Accepted, done.
11887	44	2			Do dust storms also affect wind power plants? [Hans Poertner and WGII TSU, Germany]	Accepted, included.
19019	45	1	45	3	It is suggested a related study for India may be cited here: Krishnan et al. (2016), while examining the aridity variations using the Standardized Precipitation-Evapotranspiration Index (SPEI) in the historical simulations of a global climate model (LMDZ4) with high-resolution zooming over South-Asia, found a marked increase in the propensity of Indian monsoon-droughts during the post-1950s, which is congruent with observations (Kumar et al. 2013). References: Krishnan, R., T. P. Sabin, R. Vellore, M. Mujumdar, J. Sanjay, B. N. Goswami, F. Hourdin, J.‐L. Dufresne and P. Terray, 2016, Deciphering the desiccation trend of the South Asian monsoon hydroclimate in a warming world. Climate Dynamics, 47, 1007–1027, DOI 10.1007/s00382-015-2886-5 Kumar KN, Rajeevan M, Pai DS, Srivastava AK, Preethi B (2013) On the observed variability of monsoon droughts over India. Weather Clim Extrem 1:42–50 [Sanjay Jayanarayanan, India]	Noted. Thank you. However the study suggested would add evidence to historical trends, here we discuss on future projections. We believe that these papers fit particularly well to Chapter 2 in this report, we recommended these to Chapter 2 for consideration.
19021	45	3	45	4	It is suggested a related study for India may be cited here: Ramarao et al. (2015) showed that a future climate projection based on RCP4.5 scenario indicated the possibility for detecting the summer-time soil drying signal over the Indian region during the 21st century in response to climate change. (Ramarao, M.V.S., Krishnan, R., Sanjay, J., and Sabin, T. P., 2015, Understanding land surface response to changing South Asian monsoon in a warming climate, Earth Syst. Dynam., 6, 569–582, doi: 10.5194/esd-6-569-2015). [Sanjay Jayanarayanan, India]	Thank you. Noted, added
41545	45	18	45	19	"Evidence from precipitation, runoff or photosynthetic uptake of CO2 suggest that a future warmer world will be less [Cristobal Felix Diaz Morejon, Cuba]	Reference to Roderick et al has been added
18333	45	18	45	19	references (as well as more explanations) are needed to support this statement about decreasing aridity. [Edouard Davin, Switzerland]	Reference to Roderick et al has been added
5785	45	18	45	19	any indicator or reference! [Sanaz Moghim, Iran]	Reference to Roderick et al has been added
39155	45	25	45	25	IS92a not defined. [, United States of America]	An explanation in brackets has been provided

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11889	45	6			Please spell out the name of the Report in full: IPCC Special Report on Global Warming of 1.5°C (SR15) and provide the chapter in which this information was provided, and cite it using the reference convention (First author last name et al 2018) [Hans Poertner and WGII TSU, Germany]	Corrected
18331	45	11			this section about the limitation of the AI is essentially a repetition of 3.3.1. This would be better to refer to section 3.3.1 and thus avoid the redundancy. [Edouard Davin, Switzerland]	Noted. We agree with the reviewer that section but we believe that it is importan to emphasize that to discuss the potential misleading conclusion that increases in Aridity may hav as the onl indicator of desertification. We have made some changes and refer to section 3.3.1
18335	45	20			Is aridity increasing or decreasing? This is ending on a massive contradiction. What is the final conclusion? [Edouard Davin, Switzerland]	Noted. Aridity measured as increases in Potential Evapotranspiration has increased but this uses assumptions that are not valid when atmospheric CO2 is changing (see section 3.2.1 and 3.3.1).
11891	45	25			reference IS92a [Hans Poertner and WGII TSU, Germany]	Accepted. Reference added
13565	45	33			Delete "(medium to high confidence)"; not necessary [Lourdes Tibig, Philippines]	Rejected. Page 45 line 33 does not have the uncertainty statement
11893	45	35			Specify which previous IPCC Reports these were [Hans Poertner and WGII TSU, Germany]	Specified and reference added
511	46	22	43	30	In the first sentence, "hydric soil erosion" should be used instead of "soil eroion" since the following references concern hydric erosion only and not wind erosion. [Beatrice Marticorena, France]	Noted. We thank for the suggestion but we prefer to continue with soil erosion for consistency.
39157	46	1	46	12	There has been more recent work -- for example, the USDA report on food security and climate change (https://www.usda.gov/oce/climate_change/FoodSecurity.htm). [, United States of America]	Noted.
15735	46	19	46	20	The word "Iran" is suggested to be deleted; because social and political issues are not barriers to expending energy renewable in Iran, rather it can be argued that illegal sanction by the USA has adversely effected Iran's development in expanding renewable energy production. [, Iran]	Noted. Word "Iran" does not appear in page 46 lines 219-20. Could it be a differente chapter/section?
25393	46	21	46	21	The main findings of 3.6.2 should be synthesized in a comprehensive map, similarly as in Fig3.1 [, France]	Noted. Thank you for the suggestion however we are not able to find a way to synthesise these very diverse results, from different scales, using different methods into a coherent, readable and useful map.
15737	46	21	46	21	Add to the beginning of the line 21: "Iran intends to acquire technologies pertaining the production of renewable energy resources in order to align itself with sustainable development objectives." But "sanctions by the UN and by the US have affected international trade and financial transactions with Iran, which has made technology transfer and financing renewable energy projects more difficult and expensive. The sanctions have also limited foreign investment in different sectors, including renewable energy". Source: Moshiri, Saeid, Lechtenböhmer, Stefan, 2015, "Sustainable Energy Strategy for Iran", Wuppertal Institute for Climate, Environment and Energy, Berlin. [, Iran]	Rejected. The section (Page 46, line 21) describes future projections of soil erosion as consequence of climate change. Also, policy prescriptive.
8279	46	21	46	21	How about future projection of dust storms and health impacts. [Noureddine Yassaa, Algeria]	Noted. We could not find literature studying future health impacts of dust storms at different warming levels. The literature of climate change impacts on dust storm activity by itself is a critical knowledge gap.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
1449	46	22	46	30	The impact of climate change on soil erosion has been studied by many authors. Both an increase and a decrease of soil erosion has been projected. Some authors project a decrease of soil erosion, e.g. Klik & Eitzinger (2010) for Australia, Maina et al. (2013) for Madagascar, Bangash et al. (2013), Zabaleta et al. (2014) and Bussi et al. (2014) for Spain, Simonneaux et al. (2014) for Marocco, Nerantzaki et al. (2015) for Greece, while others project an increase of soil erosion, e.g. Nunes et al. (2013) and Carvalho-Santos et al. (2016) for Portugal, Rodriguez-Lloveras et al. (2016), Rodríguez-Blanco et al. (2016) and Eekhout et al. (2018) for Spain, Azim et al. (2016) for Pakistan, Zare et al. (2016) and Azari et al. (2016, 2017) for Iran and Kourgialas et al. (2016) for Greece. Most interestingly, some authors consider the increase of precipitation intensity, which most often leads to an increase of soil erosion, such as Nunes et al. (2013), Bussi et al. (2014), Simonneaux et al. (2014), Azim et al. (2016), Rodríguez-Blanco et al. (2016) and Eekhout et al. (2018). References (with doi): Klik et al. (2010): 10.1017/S0021859610000158, Maina et al. (2013): 10.1038/ncomms2986, Bangash et al. (2013): 10.1016/j.scitotenv.2013.04.025, Zabaleta et al. (2014): 10.2134/jeq2012.0209, Bussi et al. (2014): 10.1007/s11368-014-0956-7, Simonneaux et al. (2014): 10.1016/j.jaridenv.2015.06.002, Nerantzaki et al. (2015): 10.1016/j.scitotenv.2015.07.092, Nunes et al. (2013): 10.1016/j.catena.2011.04.001, Carvalho-Santos et al. (2016): 10.1002/hyp.10621, Rodriguez-Lloveras et al. (2016): 10.1016/j.catena.2016.04.012, Rodríguez-Blanco et al. (2016): 10.3390/w8100444, Eekhout et al. (2018): 10.5194/hess-22-5935-2018, Azim et al. (2016): 10.1016/j.ijsrc.2015.08.002, Zare et al. (2016): 10.1007/s12665-016-6180-6, Azari et al. (2016): 10.1080/02626667.2014.967695, Azari et al. (2017): 10.1002/clen.201700288, Kourgialas et al. (2016): 10.1007/s11069-016-2354-5 [Joris Eekhout, Spain]	Accepted. We have added examples that illustrate the level of disagreement in projections and qualified the assessment as medium agreement
23483	46	22	46	30	This paragraph only deals with water erosion. It would be helpful to include a description of potential wind erosion responses - or at least mention that we don't really know what the responses will be because current dust models are unable to represent them. [Nicholas Webb, United States of America]	Accepted. Literature has far less assessments on impacts of future climate change on aeolian desertification Nevertheless some examples are given now in section 3.6
39159	46	24	46	24	Over what time period has erosion increased? [, United States of America]	A specification has been made (Compared to baseline 1991-2010)}
1447	46	26	46	28	Serpa et al. (2015) was performed in 2 Mediterranean catchments in Portugal, rather than northern Australia. Furtermore, this sentence does not contain any conclusions regarding soil erosion. Serpa et al. (2015) concludes that in the dry catchment (more relevant for this chapter) an increase of soil erosion is projected. [Joris Eekhout, Spain]	Thank you. Modified
39161	46	30	46	30	Probably worth restating that increased air temperatures will increase the water holding capacity of air, leading to more extreme rainfall events (high confidence) [, United States of America]	Noted. This comment does not correspond to page 46 line 30
2841	46	31	46	36	I would suggest to move this paragraph to appear directly before page 47, line 13 ("Desertification under climate..."). Doing this, the two different aspects on biological soil crusts will be combined. [Bettina Weber, Germany]	Thank you. Modified
11895	46	34	46	36	"substantially" - Can you quantify these changes? [Hans Poertner and WGII TSU, Germany]	Quantification made
6897	46	35	46	35	please add "carbon cycling" after "nitrogen cycling" [Xin-Rong Li, China]	Accepted
513	46	41	46	42	This sentence on dust aemission is totally disconnected from the previous sentence. It shoudl be included in page 44-45 on a discussion on the expected changes of wind erosion and all the associated phenomenon (sand and dust storms, dune reactivation , etc ..) [Beatrice Marticorena, France]	Accepted, removed from here.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32099	46	21	47	35	Seems to be some duplication of material in Sect 3.5. Would it be better to combine them? [Stephen Prince, United States of America]	Noted, duplications addressed. Section 3.5 looks into observed impacts, while this section to projected impacts.
23573	46	22			It is expected that future climate change will affect the possibility of soil erosion, and the literature is insufficiently supported. It is recommended to use the latest evidence that climate change exacerbates soil erosion. Climate change is a very general concept, including many parts, different types of climate change or affecting soil erosion from different aspects. It is recommended to demonstrate the erosion of soil from different aspects of climate change. Due to the different soil types, there will be different responses to climate change. It is recommended to give an example of the impact on different soils. [Huai Jianjun, China]	Accepted. More evidence has been provided for erosion, including aeolian erosion
2287	46	38			Please define "biomes". "Anthrome" is in the glossary but not "biome". Would it not be possible to include it there? Or otherwise to define it briefly here? [Nina Hunter, South Africa]	Accepted. Definition provided
11897	47	13	47	26	This section needs a link to the biodiversity section. Also, why is it sitting in-between two paragraphs on agriculture? [Hans Poertner and WGII TSU, Germany]	Accepted. Section on biocrust has been moved leaving agricultural impacts in one part and biodiversity in the following
11899	47	27	47	34	This paragraph should be linked to the agriculture information two paragraphs above [Hans Poertner and WGII TSU, Germany]	Accepted. Section on biocrust has been moved leaving agricultural impacts in one part and biodiversity in the following
39165	47	28	47	28	Please replace abiotic controls with something more accessible. What does this refer to? [, United States of America]	Noted. Term has been replaced
26647	47	28	47	28	"abiotic controls of desertification" is unclear and introduces terminology not previously used [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Noted. Clarification made
8287	47	37	47	37	Response measures and adaptation options to dust storms under warming climate need to be assessed. [Noureddine Yassaa, Algeria]	Noted, the literature is limited on impacts of global warming on dust storms.
26053	47	37	47	37	Please also asses the response measures and adaptation options against dust storms under warming climate. [Noureddine Yassaa, Algeria]	Noted, the literature is limited on impacts of global warming on dust storms.
6899	47	37	47	37	In the section of “Responses to Desertification under Climate Change”, It is suggested to increase the application of new technologies and new materials in desertification control under the background of climate change, such as using artificial propagation of biological soil crusts to control and restore desertified land. [Xin-Rong Li, China]	Accepted. Thank you for the comment. A new section has been added on stabilising sand dunes.
32101	47	41	47	41	Give a citation to explain "desertification paradigm". Is it Reynold et al.'s 2007 Dryland Development Paradigm? Reynolds, J. F., Smith, D. M. S., Lambin, E. F., Turner, B. L., Mortimore, M., Batterbury, S. P. J., Downing, T. E., Dowlatabadi, H., Fernández, R. J., Herrick, J. E., Huber-Sannwald, E., Jiang, H., Leemans, R., Lynam, T., Maestre, F. T., Ayarza, M., & Walker, B. (2007). Global Desertification: Building a Science for Dryland Development. Science, 316(5826), 847–851. https://doi.org/10.1126/science.1131634 [Stephen Prince, United States of America]	Thank you. Accepted. Citation have been added
39163	47	1	48	14	The introduction to 4.7 is very well laid out and written. [, United States of America]	Thank you.
21935	47	37	48	14	3.7. Responses to Desertification under Climate Change.. This section should be support by fiscal data. [Olusegun Adeaga, Nigeria]	Accepted, thank you for the valuable comment. Additional cost / investment considerations have been included in several sections, for example, on rainwater harvesting.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32107	47	37	62	12	There is hardly any mention of climate in Sect 3.7. Probably this section was mandated in the Scoping, but it is very odd in an IPCC report! A great deal of space would be saved without it. [Stephen Prince, United States of America]	Rejected. Thank you. We believe this section is highly relevant for desertfication and climate change. These SLM options help combat desertification, and also adapt to and often mitigate climate change through carbon sequestration. The socio-economic and policy reponse options have the same purpose, they are valid both for addressing desertification, and adapting to and mitigating climate change. It would be a gap to assess only natural aspects of climate change and desertification, without covering related technoligical and policy solutions.
2289	47	1			Please define "carbon fertilisation effect" [Nina Hunter, South Africa]	Noted. Thank you. The term has been removed from the page.
16853	47	17			Solaymani and Gosain (2014) (doi.org/10.2166/wcc.2014.076) were shown that an overall warming in future in Karkheh Basin, south west Iran, under various scenarios. The increase in temperature in the dry months (June, July and August) is greater than the increase in the wet months (January, February, March and April). The change in precipitation had the most significant impact on the magnitude of annual water yield.based on their projection. [Hamidreza Solaymani Osbooei, Iran]	Noted.
23485	48	10	48	10	Suggest adding reference to Webb, N.P., Marshall, N.A., Stringer, L.C., Reed, M.S., Chappell, A., Herrick, J.E., 2017. Land degradation and climate change: building climate resilience in agriculture. Frontiers in Ecology and the Environment, 15: 450-459. [Nicholas Webb, United States of America]	Accepted. Added reference
26649	48	14	48	14	It would be useful to add that Chapter 7 addresses the decision-making and governance contexts in which responses can be operationalised [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted. An extra sentence has been added to the text.
8281	48	17	48	17	Need to elaborate the impacts of deployment of climate geoenginnering in dryland regions on deserticafication, exemple the experience of carbone capture and storage in Algeria and its impacts on the land degradation. This is in the context of deployment of mitigation options. [Noureddine Yassaa, Algeria]	Thank you for the comment. However, the section focusses on activities and measures that can potentially avoid, reduce and reverse land degradation. Some of these may lead to an increase in biomass and soil oragnic carbon stocks, but we believe that carbon capture and storage using engineering technologies is outside of the scope of the section
26697	48	18	48	18	Check the syntax: "Many of these actions area also contribute..." [Yves Balkanski, France]	Accepted. Thank you. Amended accordingly
24833	48	18	48	19	Sentence error: "mand of these actions are also contribute". Pls correct [Justice Issah Musah Surugu, Germany]	Accepted. Thank you. Amended accordingly
39167	48	23	48	23	Define anthrome here. [, United States of America]	Accepted. A note has been added referring the reader to the glossary (to avoid any confusion in defintions)
4151	48	16	49	1	There is not a real connection between the section “3.7.1. Technologies and SLM Practices: on the Ground Actions” and the figure 3.10. As the paragraph is written, it seems an extended caption for this figure. Implications for adopting any of these activities depicted in the figure MUST be explicitly explored in the text. [Eugenia Gayo, Chile]	Noted. Each of the response options listed in Figure 3.10 are explored in sections 3.7.1.1 - 3.7.1.6
6625	48	17	54	33	There are many examples of technologies and SLM practices on local communities around the drylands worldwide and are not succesfully discussed in this section. For example in Mexico, we suggest to review the chapter 11 ""arid and semiarid ecological zone" from the book Challenger A. (1998) "Utilización y Conservación de los ecosistemas terrestres de México, pasado presente y futuro, CONABIO [, Mexico]	Noted. This is an important comment, and we acknolwedge there are a plethora of indigenous technologies applied by local communities but we are constrained by page limits to capture all such technologies and we have opted to include those ones that have wide application. Suggested reference is from 1998.
11901	48	16	62	12	Please make sure that you provide locations, quantifications, etc. where possible. provids levels of confidence, agreement, likelihood, evidence using IPCC calibrated language. [Hans Poertner and WGII TSU, Germany]	Accepted. Thank you. We have attempted ito increase the specificity of the whole responses section. Section 3.7.1. by adding certainty language and more specific examples.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
17219	49	1	49	1	Figure 3.10 should consider forestry activities such as reforestation and sustainable forest management to mitigate desertification [Hoang Anh Le, Vietnam]	Thank you. There was significant discussion on whether forestry activities should be reviewed in Chapter 3 (on drylands) or Chapter 4 (non-dryland systems). A decision was made to include reforestation in Chapter 4. I have added an additional note in the text explaining this.
7059	49	2	49	2	Should this figure be understood as implying that there is no form of land management in deserts? [Debra Roberts, South Africa]	Thank you. The intention of Fig. 3.10 is to highlight the principal resposne activities within dryland ecosystems and the typical anthromes in which they occur. The intention is not to list or illustrate all response activities that may occur in more mesic or hyper-arid areas.
31717	49	2	49	2	change to "on-the-ground" [Elizabeth Migongo-Bake, Kenya]	Accepted. Thank you. Amended accordingly.
32833	49	7	49	12	Include a sentence on agroecology and agroecological practices in this paragraph. Appropriate references to use are already in the reference list (e.g., Altieri and Nicholls). [Doreen Stabinsky, United States of America]	Acccepted. A statement added to highlight agroecological approach
39169	49	13	49	22	Shouldn't mention be made of drought and temperature resistant cultivars? [, United States of America]	Accepted, included.
25395	49	18	49	20	We suggest to define « climate-smart » whether in the chapter or in the Glossary. [, France]	Thank you. The term has been replaced in the text.
7061	49	23	49	23	Do you mean 'principal'? [Debra Roberts, South Africa]	Accepted. We have revisited the section, correcting both principle and principal where necessary.
40595	49		49		concept of anthrome introduced later (chapter 6). Consider introducing it in chapter 1 (to coordinate). Relevant for Fig 3.10 and associated text. [Valerie Masson-Delmotte, France]	Noted, Chapter 1 already discusses on anthromes in Section 1.2.2.2. and Figure 1.2. Here in Chapter 3, to avoid repetition, it was decided to merely refer to Chapters 1, 4 and 6 where the concept of anthromes is elaborated in detail as well as its definition in the glossary
3631	49	3	50	23	drip irrigation should be mentioned as an important response [Cordula Ott, Switzerland]	Accepted, done.
17221	49	3	51	25	The description focuses on dryland, however, in tropiccal and sub-tropical areas, there is also risks for desertification caused by deforestatation and inappropreate land use practices, particulalry on slopping land. It therefore suggests to consider the inclusion of research evidences for these areas. [Hoang Anh Le, Vietnam]	Thank you for note. However, responses in non-dryland ecosystems are considered in Chapter 4.
15129	49	1			The source of Figure 3.10 should be specified [Ibouraïma Yabi, Benin]	Thank you. Figure 3.10 was compiled by the chapter authors and is not sourced from elsewhere. A source will therefore not be added.
24923	49	3			It is no reasonable to promote maize in rainfed (which is sustainable) very dry environments especially when climate change may increase the risk of droughts. Maize must be irrigated or receive supplementary water given by rainfall harvesting process (see Hensley et al., 2000; Van Rensburg, 2010) see comments page 79 line 24. Most of the time if there is no surface water storage, pumping water in fossil water table is not sustainable, and increase the risk of salinization according the fact that in water-tables the lower part of water-tables are generally more concentrated in salts [Pascal Podwojewski, France]	Thank you for the comment. We did discuss it as a group and it was decided to leave the production of maize in the text as the section principally focusses on intercropping
24925	49	3			Hensley, M., Botha, J. J., Anderson, J. J., Van Staden, P. P., & Du Toit, A. (2000). Optimizing rainfall use efficiency for developing farmers with limited access to irrigation water. Water Research Commission Report, 878(1), 00. [Pascal Podwojewski, France]	Thank you for the reference. Upon review, it does not differ from the conclusions in the text. It does not conclude that non-irrigated maize production in not possible or reasonable.
24927	49	3			Rensburg, L. V. (2010). Advances in soil physics: Application in irrigation and dryland crop production. South African Journal of Plant and Soil, 27(1), 9-18. [Pascal Podwojewski, France]	Thank you for the reference. Upon review, it does not differ from the conclusions in the text. Where as it does show a clear positive relationship between rainfall and production, it does not conclude that non-irrigated maize production in not possible or reasonable.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11903	49	21			What are stem borers? [Hans Poertner and WGII TSU, Germany]	Thank you. They are insects that bore into stems of maize. The text has been changed to "stem boring insects"
90	49				Why the emphasis on soil crusts? Theses are not common. Further, they are quite fragile in most cases. [Julian Dumanski, Canada]	Noted. We now privided a discussion of the implications: The predicted loss is expected to substantially reduce their contribution to nitrogen cycling (6.7–9.9 Tg yr−1 of N) and carbon cycling (0.16–0.24 Pg yr−1 of C)
27037	50	4	50	4	What is meant by loss of rainfall? Please specify (e.g. seasonal, annual). [, Germany]	Thank you for the comment. On further reflection, the sentence has been removed from the text.
39171	50	10	50	10	Is 2000% correct? [, United States of America]	Yes, it is correct.
14429	50	23	50	50	Wind and water erosions are serious in north China. Wind erosion is mainly happened in north China arid land, and water erosion happened in semi-arid and humid region. Wind erosion had caused serious land surface desertification, dust storm happened and air quantity decrease. Therefore, there are many wind erosion and water erosion prevent measurements in these regions. All these measurements had greatly decreased wind and water erosion in north China. [Qiang Zhang, China]	Thank you for your interesting comment. Although we don't see it as directly application to this section on grazing and fire management in dry lands
14431	50	23	50	50	Liu, B.L., Zhang, W.M., Qu, J.J., Zhang, K.C., Han, Q.J., 2011. Controlling windblown sand problems by an artificial gravel surface: A case study over the gobi surface of the Mogao Grottoes. Geomorphology, 134, 461-469. Han, L.Y., Zhang, Z.C., Zhang, Q., Wan, X., 2015. Desertification assessments in the Hexi corridor of northern China's Gansu Province by remote sensing. Nature Hazards, 75, 2715–2731. Dong, Z.B., Hu, G.Y., Qian, G.Q., Lu, J.F., Zhang, Z.C., Luo, W.Y., Lyu, P. 2017. High-altitude Aeolian research on the Tibetan Plateau. Reviews of Geophysics, 55. 864–901 [Qiang Zhang, China]	As noted above, thank you for the comment, but it is not applicable to the section on grazing and fire management.
515	50	24	50	24	In terms of wind erosion, agricultural practices can have a comparable effect than climate variability (see for example Pierre et al., Land Degrad. Develop. 29: 800–811, 2018). Cultivated surfaces have higher erosion rates than fallows (See Rajot J.L., , Bulletin de la Société Géologique de France 5, 523–531, 2001), but maintaing even a low vegetation residue cover strongly limits wind erosion (see Abdourhamane Touré et al., Catena 85, 205–214, 2011) [Beatrice Marticorena, France]	Thank you for the advice and set of publications. We have included an additional paragraph in the text on this matter.
11905	50	32	50	38	Is this explained above in the drivers/mechanism section? Please ensure that sections link in with each other [Hans Poertner and WGII TSU, Germany]	Thank you. The impact of fire and grazing is included in the drivers section.
14433	50	36	50	36	Grazing had some effect on surface soil structure, water content, vegetation coverage and so on. Meanwhile, these factors also controlled wind erosion and soil nutrients. [Qiang Zhang, China]	Thank you for your comment. This section though focusses on grazing and fire management and not wind erosion
14435	50	36	50	36	Zhang, Z.C., Dong, Z.B., Zhao, A.G., 2008. The effect of restored microbiotic crusts on erosion of soil from a desert area in China. Journal of Arid Environments, 7, 710–721.Zhang, Q., Nan, Y.H., Wang, S., 2010. Impacts of oasis on the atmospheric hydrological cycle over the nearby desert,Natural Science, 2(7), 681-687 [Qiang Zhang, China]	Thank your for your comment and references. This section focusses on grazing and fire regimes and therefore the references are not applicable here.
40597	50		50		check coherency with x chapter box on fire (placed in chapter 2). No reference? [Valerie Masson-Delmotte, France]	Thank you, reference has been made to the Box
22557	50	25	51	25	The heading for this section is "Grazing and Fire Management in Drylands" but the word "fire" is only mentioned twice in the section. Its mostly about grazing. [Anastasios Kentarchos, Belgium]	Accepted. Thank you. The section has been revisited indepth to include fire more prominently.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25063	50	25	51	25	This section should pay more attention to fire management. Although it is shown in the title, fire management was not described much in the text. The role of fire in ecosystem management is described in detail in the following book, and could be used for the content here. "… fire is one most common types of ecosystem disturbance, and it is an essential stressor in many natural ecosystems. Fire plays a strong regulatory role in many ecosystems and has been applied as a forest management practice by ecologists globally. Low intensity fire at an opportune recurrence interval can promote productivity, resilience, and stability. Fire has an important role in maintaining forest biodiversity, helping flowering and fruiting of species in the undergrowth, and promoting seed germination and vegetative propagation. Low-intensity fire disturbance can facilitate forest regeneration. Prescribed fires can control insect pests. High intensity fires usually burn tree crowns and destroy the seed bank. Management with fire is conducive to the development of ecosystem but only when it is applied judiciously." Liu J., Clewell A., 2017. Management of Ecological Rehabilitation Projects. Science Press. Beijing. ISBN：9787030551368. [Junguo Liu, China]	Accepted. Thank you. The section has been revisited indepth to include fire more prominently. We have though not included your text as we would like the section to be an assessment and not neccessary provide textbook-like background.
24929	50	5			this is unlikely in dry environments. Even mulching is reducing the water evapotranspiration, there is not much organic matter available as compost or harvest residues in drylands according that i) the production of biomass is reduced especially in non irrigated areas and ii) harvest residues are very often used as complementary fodder for animals. Therefore another trade of organic matter should be promoted in dry environments and organized from cities (place were organic matter wastes will be more and more available in the future) and places of crop production. [Pascal Podwojewski, France]	Accepted. Thank you for your comment. The sentence has been removed from the text
24933	50	8			see also Page 79, line 33 water-harvesting in micro catchments are ancestral techniques several hundreds years old in different drylands over the world (Adeel et al., 2008). All techniques are collecting water from surface or subsurface runoff along a slope. The problem of rainwater harvesting is much more challenging in flat areas. [Pascal Podwojewski, France]	Accepted and agreed. That is what the narrative says. That the various water harvesting techniques have been in practice by many local communities for many years
24935	50	8			Adeel, Z.; Schuster, B. and Bigas, H. (2008). Promoting traditional water management in drylands: Adapting traditional knowledge to meet today's challenges. What Makes Traditional Technologies Tick? A Review of Traditional Approaches for Water Management in Drylands, 1. UNU-INWEH, UNU Desertification Series No. 8. [Pascal Podwojewski, France]	Noted. A statement added citing the reference
24931	50	38			This is not completely correct and very idealistic. When crusting occurs, the regeneration of grass by seedlings is reduced (evidences of protected areas with no grass regeneration in absence of herbivores) and/or are concentrated in banded vegetation because surface erosion is washing out the seeds. When cattle hooves are braking the crusts, they have a positive impact on the natural regeneration of Savannah grasses. Savannah ecosystem is a very fragile equilibrium between fires and herbivores and both need to be well managed to maintain this ecosystem productive. Because cattle or herbivores are always using the same pathways to find drinking water, even wild herbivores in national parks, these pathways are compacted even with reduced amount of animal, prone to water runoff and to gully erosion. Therefore the concept of overgrazing must be carefully used. [Pascal Podwojewski, France]	Accepted. Thank you. This sentence has been removed
25397	51	7	51	9	We suggest to specify « sustainable application of fertiliser ». [, France]	Noted. Statement corrected and rephrased

Comment No	From Page	From Line	To Page	To Line	Comment	Response
23487	51	10	51	19	I really question the inclusion of the "Savory method" due to the lack of scientific evidence to support Savory's claims, that Savory has misrepresented evidence (e.g., photographs in Ted talk) of landscapes as justification for his methods, and the methods generally oppose decades of range management science. It may be more constructive to cite established SLM approaches in more recent range management literature. See Briske DD, Bestelmeyer B, Brown J., Fuhlendorf SD, H. Polley W. 2013. The Savory Method can not green deserts or reverse climate change. Rangelands. 35(5):72-74. & Briske DD, Bestelmeyer B, Brown J.. 2014. Savory's unsubstantiated claims should not be confused with multipaddock grazing. Rangelands. 36(1):39-42. [Nicholas Webb, United States of America]	Noted. The Savory Method was noted based on previous reviewers comments. We do though concur with your view, that the limitations / reality of it do need to be highlighted, which we have done in the remainder of the paragraph.
22559	51	17	51	17	The word "principle" should be "principal" [Anastasios Kentarchos, Belgium]	Accepted. Amended accordingly.
23489	51	23	51	23	Suggest adding another more specific reference that illustrates the benefits of prevention/early action benefits - Webb NP, Stokes CJ, Marshall NA, 2013. Integrating biophysical and socio-economic evaluations to improve the efficacy of adaptation assessments for agriculture. Global Environmental Change, Vol. 23, 1164-1177. doi:10.1016/j.gloenvcha.2013.04.007 [Nicholas Webb, United States of America]	Accepted. Thank you. The reference has been added accordingly
25399	51	33	51	35	The paragraph does not report the case of land returning to forests and its effects on climate change (increase of the carbon sink). We suggest to add a word on this trend. [, France]	Thank you for the comment. Bush encroachment is not the reforestation of a previously forested landscape, but rather an increase in woody plants and cover in previous grassland ecosystems. This section there focusses on how to clear bush encroachment and does not provide an assessment of changes in carbon stocks and ecosystem services due to the phenomenon.
32103	51	35	51	35	"...bush encroachment, often regarded as a type of desertification, can lead to..." [Stephen Prince, United States of America]	Accepted. Ammeded accordingly.
23491	51	37	51	37	Suggest adding reference to Schooley RL, Bestelmeyer BT, Campanella A. 2018. Shrub encroachment, productivity pulses, and core-transient dynamics of Chihuahuan Desert rodents. Ecosphere. 9(7):Articlee02330. [Nicholas Webb, United States of America]	Noted.
7063	51	40	51	40	The proportion of rural households that are dependent on wood fuel is important information and a 2004 reference does not do sufficient justice to this piece of information. This needs to be updated with a more current reference. [Debra Roberts, South Africa]	Accepted. Thank you for the advice. A 2017 study has been added that includes data from seven additional countries.
39173	52	1	52	19	What about invasive species? [, United States of America]	Due to their importance, invasive plant species are considered in separate Case Study (3.8.3)
14437	52	31	52	31	There are some valuable rainfed agriculture infrastructures in north China arid land, which had obviously improved local people's production and living standards. [Qiang Zhang, China]	Noted. Thank you for the note. We have read the paper below and it is not directly applicable to this section.
14439	52	31	52	31	Zhang, Q., Wang, S., 2005. Characteristics of Hydrometeorology and its Simulation over Desert in the Arid Region of Northwest Chin, BMRC Research Report No.111, Hydrometeorological Applications of Weather and Climate Modelling, edited by A.J. Hollis, Australian Government Bureau of Meteorology, Melbourne, 41-45. [Qiang Zhang, China]	Thank you for reference to this interesting paper. Unfortunately, it is not directly applicable to this section.
24937	52	6			in case of bush encroachment in rangelands, the encroached species are not aliens invasive species but local species of ligneous plant especially Acacias/Vachellia sp. in Africa, more adapted to natural CO2 fertilization than natural C4 grasses. So the original state cannot be found because it would need a serious decrease of atmospheric CO2... The proposal of Milton is much more realistic. [Pascal Podwojewski, France]	Accepted. Thank you for the note. I have included reference to Milton's paper and changed the text accordingly.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
24939	52	10			There are many evidences in South Africa that the driving factors are much more complex than just fires and cattle overgrazing (Grellier et al., 2012). [Pascal Podwojewski, France]	The intention is to highlight the principal drivers of bush encroachment. The quoted paper by Grellier et al. 2012 itself notes that "The removal of grass by grazing and/or fire had the most important effect on Acacia recruitment in savanna" with other factors having a minor effect. We have therefore not changed the text.
24941	52	10			Grellier, S., Barot, S., Janeau, J. L., & Ward, D. (2012). Grass competition is more important than seed ingestion by livestock for Acacia recruitment in South Africa. Plant Ecology, 213(6), 899-908. [Pascal Podwojewski, France]	The intention is to highlight the principal drivers of bush encroachment. The quoted paper by Grellier et al. 2012 itself notes that "The removal of grass by grazing and/or fire had the most important effect on Acacia recruitment in savanna" with other factors having a minor effect. We have therefore not changed the text.
22019	52				May consider adding “in first paragraph” that RWH alleviate flood impact and extreme sudden intensity of rainfall that is experienced lately with the changing pattern with climate change in the middle east region [Hala Abayazid, Egypt]	Accepted. Thank you. An additional sentence has been added.
7065	53	8	53	9	What accounts for this large difference between Asia and Africa? [Debra Roberts, South Africa]	Thank you for raising this. We have received the text and stats and the difference in not necessarily due to the continent on which the study took place, but relative rainfall. Most sites in Africa were wetter than those in Asia. The relative impact of RWH on crop production generally increases with increasing dryness. We have ammended the text accordingly.
14683	53	14	53	16	It should also be stated that storing water inappropriately in such a situation can also result in vector-borne diseases (e.g. malaria). [, Canada]	Thank you. Schistosomiasis and malaria have been added. The cited review by Boelee et al. 2013 provides a comprehensive list of diseases related to water
7067	53	22	53	22	What is your assessment of the use of Halophytes? [Debra Roberts, South Africa]	Taken into account. Point added in the text.
92	53	27			Not true. Salininized soil can also become very hard, e.g. Solonetz soils [Julian Dumanski, Canada]	Taken into account. Text revised and clarified.
24943	54	2	54	7	What about salt tolerant fruit production such as dates (Phoenix dactylifera) or Pom granate (Punica granatum) that are mostly cultivated in warm arid areas. [Pascal Podwojewski, France]	Taken into account. Text added.
14441	54	7	54	7	There are many works on soil salinization prevent in north China, therefore, it need to be added. [Qiang Zhang, China]	Taken into account. References added.
6901	54	11	54	11	Before 3.7.1.6, that is, after line 11, there is no introduction of using plants and sand barrier to fix dunes to prevent the expansion of sandy deserts/dunes (Li et al., 2006. Ecological Engineering, 28: 149-157.) [Xin-Rong Li, China]	Accepted, information on sand dune fixation is included.
3633	54	13	54	33	Financial inclusion would be an important concept to include here... [Cordula Ott, Switzerland]	Accepted, financial inclusions is mentioned through access to credit, which will enable SLM adoptions.
22561	54	16	54	16	" yields social returns in the range of 2–5 dollars over a 30-year period "- there is no clear immediate incentive in this i.e. non-provisioning ecosystem services. [Anastasios Kentarchos, Belgium]	Noted. Social returns also include provisioning services, clarified.
40599	54		54		how does SLM integrate in the concept of land transition (as in SR15), or climate resilient development pathway (CRDP, as in SR15)? What about the integration of adaptation and mitigation strategies? [Valerie Masson-Delmotte, France]	Noted. Many of these options that we discuss are similar to land transition in SR15.
96	54	13		33	Youm miss the most important point, i.e. promoting amd supporting farmer-led community action groups. This has been shown to be the most effective way to mitigate desertification [Julian Dumanski, Canada]	Accepted, relevant text included. We also discuss this extensively in the next section.
3635	54	13			not totally clear why this subchapter is not part of the following chapter '3.7.2 Socio-economic responses' [Cordula Ott, Switzerland]	Accepted. moved.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
94	54	13			What does incentivising mean? Choose a better word, e.g. Adoption [Julian Dumanski, Canada]	Thank you. "Incentivising" is the appropriate term for the broad range of incentives that may be used to stimulate the uptake and long-term implementation of climate change activities. It includes "results-based payments" e.g. payment for carbon or water, enhanced access to natural resources as well as access to equipment, training, knowledge.
22563	55	1	55	7	There is need for awareness raising and capacity building on the benefits of "local collective action and indigenous and local knowledge are still crucial to the ability of households to respond to the combined challenge of climate change and desertification" [Anastasios Kentarchos, Belgium]	Accepted, included.
39175	55	2	55	2	Add sentence explaining how desertification limits mitigation and adaptation. [, United States of America]	Accpted, added "by reducing adaptive capacities".
32835	55	8	55	12	The equation of traditional knowledge with agroecology is erroneous. Agroecological methods are based on ecological processes and relationships, as is indigenous and TK, but agroecology is certainly much more than just TK. The equation is false and should be modified to be consistent with a broader use of the term agroecology. [Doreen Stabinsky, United States of America]	Accepted, indicated that ILK is part of agroecological knowledge, which is a broader concept.
25401	55	9	55	12	Agroecology could have been mentionned in 3.6 as it is not only the use of indegenous and local knowledge but a wide range of agronomic and soci-economic options to answer to climate and desertification challenges. See GENERAL COMMENT ON AGROECOLOGY [, France]	Accepted, included.
26651	55	10	55	10	The equation of ILK with agroecology seems a very partial view of both concepts [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, indicated that ILK is part of agroecological knowledge, which is a broader concept.
25403	55	36	55	39	It should be specified that agroecology is strongly based on collective action. Diversification of agriculture, agroforestry, ecosystem based adaptation and others are quite ofter mentioned, but agroecology no, so we propose to add a box in the SPM, and in the chapter 6 and 7, and in the glossary, to clarify that agroecology encompasses all this, so it's present even when not mentioned. [, France]	Noted, agroecological practices are discussed in Chapter 3 under section 3.6.1
24945	55	3			Page 50 line 8 see also Page 79 (Adeel et al., 2008) [Pascal Podwojewski, France]	Rejected, comment cannot be understood.
3647	55	9			Hans-Rudolf Bork! Bork is family name = HR Bork; correct reference page 55 [Cordula Ott, Switzerland]	Accepted, corrected.
3637	55	32			Hans-Rudolf Bork! Bork is family name = HR Bork; correct reference page 55 (and in list of references) [Cordula Ott, Switzerland]	Accepted, corrected.
3639	55	36			Hans-Rudolf Bork! Bork is family name = HR Bork; correct reference page 55 [Cordula Ott, Switzerland]	Accepted, corrected.
22565	56	13	56	23	Ownership of farm- led innovations is crucial for adoption of technologies. [Anastasios Kentarchos, Belgium]	Noted, by definition farmers would feel ownership for those innovations that they themselves developed.
26653	56	21	56	23	The example of mobile phone-based applications seems an odd example of farmer-led innovation [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Rejected, mobile phone-based applications are not given as an example of farmer-led innovation, but as a new tool that can further facilitate farmer innovations.
2843	56	30	56	31	"…to diversify their livelihood sources…" [Bettina Weber, Germany]	Noted, we are not sure what the reviewer meant, but we understood this as a suggestion to add an assesment language to this statement, which was now added.
26655	56	34	56	34	suggest replacing "smallholder" with "poorer" at line 38. E. Fratkin "Seeking Alternative Livelihoods in Pastoral Areas" in Catley, Lind and Scoones, Pastoralism and Development in Africa, Routledge (2013) is an additional reference on diversification. [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Acepted, modified.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3829	56	43	56	44	we shall take for granted that migration is a way to reduce the population density over areas where human needs exceed the local food resources, possibly further diminished under the effect of climate change. Then, by the same token, steps taken in order to reverse or at least stop population growth, in similar circumstances, should be taken into consideration. I do not offer a sentence to this effect: introducing this issue in the present paragraph is indeed not easy, since unlike migration, calling a halt to population growth could never be considered as some kind of economic diversification. Actually, I wonder about assimilating migration to a "form of economic diversification"? What would the migrants say? [Philippe Waldteufel, France]	Rejected, this paragraph is concerned with economic diversification, and not with population policies. Migration, including seasonal circular migration, is a form of diversification of economic activities.
6627	56	43	57	22	Migration is a local adaptation strategy to environmental change, nevertheless it also could cause social, cultural, economic and environmental problems in the arrival sites, including desertification in the medium and long term, but this is not mentioned nor analyzed in the section [, Mexico]	Accepted, in-migration effects are now discussed in Section 3.5.2.9.
26657	56	43	57	22	I think some linkage should be made with the discussion of migration in 3.5.2.7, and the methodological issues of seeing migration as both an impact of and a response to desertification [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Acccepted.
4153	57	2	57	3	The case for the Aymara rural population could be also incorporated. The reference for this is: ima M, Christie DA, Santoro MC, Latorre C (2016) Coupled Socio-Environmental Changes Triggered Indigenous Aymara Depopulation of the Semiarid Andes of Tarapacá-Chile during the Late 19th-20th Centuries. PLoS ONE 11(8): e0160580. [Eugenia Gayo, Chile]	Accepted, included.
26195	57	25	57	34	Add reference: Marques, M.J., Schwilch, G., Lauterburg, N., Crittenden, S., Tesfai, M., Stolte, J., Zdruli, P., Zucca, C., Petursdottir, T., Evelpidou, N., Karkani, A., AsliYilmazgil, Y., Panagopoulos, T., Yirdaw, E., Kanninen, M., Rubio, J.L., Schmiedel, U., Doko, A. 2016. Multifaceted Impacts of Sustainable Land Management in Drylands: A Review. Sustainability 8.https://doi.org/10.3390/su8020177. [Markku Kanninen, Finland]	Acepted, included.
6629	57	29	57	32	A third way of policy response is the inaction [, Mexico]	Noted.
8721	57	3	61	11	Education and exchange of good practices have an important role to play in relation with desertification, too. These aspects can be further addressed. [Mihaela Stefanescu, Romania]	Accepted, this is discussed under Expanding access to rural advisory services. To make this specific, we changed the title as Education and expanding access to rural advisory services.
1317	57	25	61	11	Accelerating urbanization, improving food trade and enhancing conservation can responses to desertification [Oswaldo Lucon, Brazil]	Accepted, relevant discussion is in 3.7.3.
25065	57	24	62	11	“Economic Diversification” need more solutions (only 2 solution examples) to demonstrate a balanced importance compared with “combating desertification” (9 solution examples) [Junguo Liu, China]	Rejected, this higher coverage of policy responses for addressing desertification under changing climate is not surprising since this is the core focus of this chapter. Policy responses through economic diversification are broader and those selected are specifically relevant in this context
26275	57	24	62	12	Under the heading "3.7.3 Policy Responses" In addtion to policy responses towards combating desertification under the climate change "Land Degradation Neutrality initiative" might be explained . Since LDN propose integrated land use planning, landscape aproach, improvement of enabling environment, land governance and active participation of stakeholders these concepts might be discussed and addressed as policy options for combating desertification. [Ahmet Şenyaz, Turkey]	Rejected. We indicated that LDN framework is an overarching conceptual and operational platform for these policy responses. LDN framework is explained in detail in Chapter 4 since its relevant and applies globally not only in drylands. Listing LDN here among these specific policy responses (which are all part of LDN) will create confusion and is incosistent with LDN being an overarching framework. We strengthened the discussion on integrated land use planning, landscape aproach, improvement of enabling environment, land governance and active participation of stakeholders.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3641	58	1	58	12	market access means to improve markets, especially local and regional markets ... First for for selling (what often first asks for financial inclusion, for example through microcredits etc.. Secondly, markets are importnat for bying... they contribute to the diversity of strategies that families and communities to mitigate times of stress.... [Cordula Ott, Switzerland]	Accepted, the current explanation in the text is consistent with these ideas. We added some more explanation to this effect.
31719	58	1	58	12	This section should also include mention of food-value-chain (from germplasm, harvest, storage, market and reduction of waste from source to sink) related support policy, and not just market access [Elizabeth Migongo-Bake, Kenya]	Rejected, this is a focused section on the role of acces to markets which is consistently mentioned in the literature as a driver for SLM. This section is not meant to comprehensively cover all development issues along the food value chain. For discussion on food value chain aspects, please refer to Chapter 5.
26659	58	1	58	12	This paragraph needs more discussion of the specific issues relating to livestock marketing, including the specific public-good infrastructure needs (local markets, abattoirs) and both within-country and international veterinary-related barriers. McPeak, Little and Demment "Policy Implications and Future Research Directions" in McPeak and Little Pastoral Livestock Marketing in Eastern Africa (2006) should be a good reference. [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, included.
39177	58	2	58	2	Should be 'pastoral and farming households'. Not all dryland households are farmers. [, United States of America]	Accepted, changed.
25213	58	3	58	3	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, corrected.
27039	58	10	58	12	Please consider expanding briefly on the institutional constraints that are the most hindering for market access. [, Germany]	Accepted, included.
32527	58	13	58	13	The term 'gender empowerment' is not a standard term in the context of gender issues. In this particular context, since the paragraph (line 13-29) focuses on women's empowerment, the term 'gender empowerment could be replaced with 'women's empowerment'. Additionally, Section 5.6.4 in chapter 5 uses the title 'women's empowerment' to discuss similar issues as in this paragraph. [Hanna Paulose, United States of America]	Accepted, corrected.
32529	58	16	58	16	The statement 'This includes.....differences of men and women in processing similar information...' is based on a reference which is quite old (Slovic, 1999). It needs to be revisited to make sure that this argument is still valid. The notion that men and women have different cognitive skills and differnt methods of processing inforamation is widely contested and often discredited by researchers and hence needs to be removed from this report. [Hanna Paulose, United States of America]	Accepted, removed.
7069	58	17	58	17	Consider replacing 'to' with 'of' [Debra Roberts, South Africa]	Accepted, corrected.
39179	58	24	58	29	Please expand briefly to describe these novel concepts. Just listing them does not convey much to the reader. [, United States of America]	Accepted, clarified.
25215	58	31	58	31	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, corrected.
8977	58	37	58	37	"Soil conservation" is not defined here or in the glossary, but it should be. It refers to adoption of conservation-effective measures (biological and engineering) to reduce risks of accelerated soil erosion and restore eroded and desertified lands. [Jean-Luc Chotte, France]	Accepted, included into Glossary.
26661	58	39	58	39	replace "advisory" with "agricultural" [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, modified.
3643	58	13			Term: women empowerment (or men, elder people or young people) makes sense in this context, but not gender empowerment..... (and women empowerment is crucial). gender empowerment exists as concept, but not feasible to use here [Cordula Ott, Switzerland]	Accepted, corrected.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32269	59	4	59	4	Could add "State and transition" conceptual models can be used to organize science and SLM information for specific land areas for use in education and extension, including the characteristics of healthy and desertified states and management and restoration technologies. (Bestelmeyer et al. 2017). Bestelmeyer, B.T., A. J. Ash, J. R. Brown, B. Densambuu, M. E. Fernandez-Gimenez, J. Johanson, M. R. Levi, D. R. Lopez, L. Rumpff, H. R. Peinetti, and P. L. Shaver. 2017. State and transition models: Theory, applications, and challenges. Pp. 303-346 in D. D. Briske, ed. Rangeland Systems: Processes, Management and Challenges. Springer. [Nicholas Webb, United States of America]	Accepted, as "organize science and SLM information in a location-specific manner for use in education and extension", since we are making a broader point, and the specific models such as "state and transition" are assumed to be included in this.
3645	59	5	59	20	Key issue not included: overlapping formal and informal rights have to be taken into account in the securing land tenureship. Land users depending and relying on informal rights are often forgotten and become losers in the process. This is anothre reason why in-depth knwoldge obn the (lokal) context is necessary for any intervention [Cordula Ott, Switzerland]	Accepted, included.
26663	59	5	59	20	This would benefit from a cross-chapter reference to 7.7.4 [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, done.
25405	59	17	59	20	We suggest to add : on the basis of the Voluntary guidelines on the responsible governance of tenure of land, fisheries and forests in the context of national food security (VGGT) endorsed by the Comity on World Food Security in 2012 [, France]	Rejected, policy prescriptive.
32531	59	19	59	19	The term 'gender-responsive' is preferable to gender focused when discusing policies, programmes, and activities which are action oriented. UN-women's working definition for the term 'gender responsive is as follows: "Gender-responsive:37 a term used to describe laws, policies, programmes and public services that are formulated and/or delivered to: i) take into account existing structures and relations of gender inequality and seek proactively to overcome and remove them; ii) identify and bring attention to women’s contributions and critical roles as agents and leaders, in order to facilitate gender equality, the empowerment of women and women’s enjoyment of human rights." [Hanna Paulose, United States of America]	Accepted, changed to gender-responsive.
1455	59	21	59	33	Some key references about case study and policy of ecological compensation for desertification control in China should be added, such as subsidies of national public welfare forest protection, afforestation and grazing prohibition in grassland. For example, Li, D. J., Xu, D. Y., Wang, Z.Y., et al., 2018: Ecological compensation for desertification control: A review. Journal of Geographical Sciences, 28(3): 367-384. [Duanyang Xu, China]	Accepted, added.
24835	59	31	59	33	Sentence error. "despite being unfair" -- unfair to whom? [Justice Issah Musah Surugu, Germany]	Accepted, clarified.
22567	59	34	59	43	One has to weigh the pros and cons between decentralising the management of natural resources and mantaining a top-down public policy. [Anastasios Kentarchos, Belgium]	Accepted, we discussed the potential cons of decentralzing natural resoruce management and also indicated at how local and central need to be considered together.
3649	59	34	59	43	as thsi subchapter is about response options, it might be good to say that in collaboration with locals new institutions have to be identified/ built up. Only then they are contextualized, only through this decentralization makes sense.. [Cordula Ott, Switzerland]	Accepted, included.
3651	60	18	20		a better structure of this report could significantly contribute to bring knowledge together. Basically, not more research is needed, but making better use of existing knowledge [Cordula Ott, Switzerland]	Noted, this is consistent with the commented statement on the imortance of knowledge sharing. Broadly speaking, investment on dry lands and desertification research especially in interaction with climate change remains low, therefore more work is needed in these areas. However, it is true that efforts must be done to make use of existing knowledge.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39181	60	3	60	9	Well said as written, but should add sentence calling out the need for more research into motivating SLM-supporting innovations and technologies. The science is clear that many practices can help, but aren't being adopted; shouldn't understanding and overcoming this adoption gap be a major objective? [, United States of America]	Accepted, done.
25189	60	8	60	8	SDGs, if abbreviation is introduced on page 14, line 31 [Alexander Erlewein, Germany]	Accepted, corrected.
517	60	21	60	37	It should be mentionned that there is no specific network or survey to monitor the surface winds responsible for wind erosion. Wind speed are measured at meteorological station with, at the best, a time step of 3h, which is not relevant for the time-scale of erosive winds (see Bergametti et al., Journal of Geophysical Research: Atmospheres, 122. https://doi. org/10.1002/2017JD027471, 2017). The meteorological station are very scarse in arid regions. It is also important to monitor particulate concentrations that are the most relava,t parameter for health impact studies and that are rarely monitored in arid and semi-arid regions (see Marticorena et al., Atmos. Chem. Phys. 10, 8899–8915, 2010; Kaly et al., Atmos. Res., 2005; de Longueville et al., Human and Ecological Risk Assessment: An International Journal, 19:6, 1595-1617, DOI: 10.1080/10807039.2012.716684, 2013). [Beatrice Marticorena, France]	Accepted, relevant discussion included.
23493	60	28	60	37	Suggest adding National Wind Erosion Research Network (USA) [Nicholas Webb, United States of America]	Accepted, added.
3655	60	38	61	11	in this discussion, I miss a bit a more dynamic picture. The pressure on semi-arid and dryland due to population increase, in-migration and CC, ids high, with unceasing demand of biomass resulting in desertification [Cordula Ott, Switzerland]	Noted, the literature on the contribution of the use of biomass for energy on desertification is not so straighforward. The earlier literature on "fuelwood crisis" is currently very much contested. The current assessment reflects this cautiousness referring to the context specific nature of the fuelwood collection-desertification link.
8283	60	38	61	11	Off-grid renewable energy deployment in remote areas instead of using fossil fuels prevents the contamination of soil and land degradation. They also serve for pumping wtare and preserving soils. [Noureddine Yassaa, Algeria]	Noted, we appreciate this important comment, but could not find literature specifically on the issue of soil contamination. Any supporting literature would have been appreciated. Discussion on renewable energy for pumping water is given in Section 3.7.3.
3653	60	38			Although desertification is the major issue here, a link could be made to other issues, for example health. Using biomass for energy often has negative health impacts through smoke. And it is a major workload of women to get the biomass [Cordula Ott, Switzerland]	Accepted, included.
3657	61	9	61	11	as well as access to! [Cordula Ott, Switzerland]	Accepted, included.
39183	61	13	61	13	Better title: Policy Response Supporting Economic Diversification. [, United States of America]	Accepted, included.
3831	61	14	61	16	while this sentence implicitly suggests that climate change, population pressures and so on are external factors and we have no choice but to put up with them, such a feeling is fallacious. Same as efforts can be made to ease the pressure induced by climate change, the same holds true for population pressures (or for population density which drive population pressures…). [Philippe Waldteufel, France]	Noted
39185	61	21	61	21	Investing 'in' rather than 'into'. [, United States of America]	Accepted, modified.
8285	61	21	61	21	Investing into irrigation through the integration of clean energy [Noureddine Yassaa, Algeria]	Accepted, included a link to clean energy within the paragraph.
22569	61	21	61	31	This section is about irrigation and agricultural commercialisation but the word "irrigation" is only mentioned once in the paragraph. [Anastasios Kentarchos, Belgium]	Accepted, more information added.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
3659	61	21	61	31	what is the conclusion of this paragraph? Water is a much contested resource... especially under drier condition.. needs very sophisticate procedures! Investments in intensification of local faming households is most important for their self-reliance... and access to local markets... [Cordula Ott, Switzerland]	Accepted, key message with IPCC uncertainty language added.
26665	61	21	61	31	This paragraph needs more discussion of the downsides of irrigation for pastoralists particularly the encroachment on riverine areas that serve as key dry-season resources. See Roy Behnke and Carol Kerven, Replacing Pastoralism with Irrigated Agriculture in the Awash Valley, North-Eastern Ethiopia: Counting the Costs in Catley, Lind and Scoones, Pastoralism and Development in Africa, Routledge (2013) [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, included.
5787	61	39	61	40	any reference for this sentence! [Sanaz Moghim, Iran]	Accepted, added.
40601	61		61		implications of large scale deployment of solar panels (Yan Li et al Science 2018) : relevant? To be considered also with ch 2 and 3. [Valerie Masson-Delmotte, France]	Accepted, included.
28653	61	13		16	Policy responses towards economic diversification. Policy responses for combating desertification, population growth, Land demand,high food demand as well as the need to reduce poverty. I recommend a strict preventive measures on land use most especially in Sub-Sahara Africa and Integrated combat system on poverty alleviation. Tge population growth in this region (semi arid and arid) is growing consistently, demand for food os very high as well as land demand. Poverty rate is high most especially in Sub-Sahara Africa. The UNCCD must take strict actions, preventive measures and strong adaptive response on poverty alleviation to combat poverty in relation to desertification. Integrated combating techniques must be implemented most especially in Afica(Lake chad). In desertification mitigating techniques and definition analysis; Biodiversity Action plans must be put in place as preventive and Adaptive response in other to protect the endangered flora and fauna,(Reforestation is strongly advised). Also recommend Urban and rural education on the desertification extreme effects, the consequences in relation to poverty. The food and Agriculture organisation of the United Nations who launched the FAO Drylands Restoration initiative in 2012to draw together knowledge and experience on dryla ds restoration should be revisited because some areas in the Arid and Semi Arid regions are experiencing sets back in the restoration of drylands.E.g Northern part of Nigeria stretching from Niger and Chad republic. Forest Green Wall must be implemented to take quick action drylands. (Forest Green Wall strongly agreed). [Abiodun Adegoke, Nigeria]	Noted.
100	61	21			Land suitable for irrigation is now effectively all used up. [Julian Dumanski, Canada]	Rejected, this is inconsistent with the numerous evidence that considerable areas suitable for irrigation in Sub-Saharan Africa are not currently equipped with irrigation. For rexample, Y. Altchenko, K. G. Villholth. Mapping irrigation potential from renewable groundwater in Africa – a quantitative hydrological approach. Hydrology and Earth System Sciences Discussions, European Geosciences Union, 2015, 19 (2), pp.1055-1067 . We included a sentence on irrigation potentials.
3661	61	32			what is the policy option in this paragraph? [Cordula Ott, Switzerland]	Accepted, rephrased as Facilitating structural transformations
39187	62	1	62	1	What is 'this period'? [, United States of America]	Accepted, paraphrased.
25407	62	15	62	16	The shift in agricultural choices such as diversification to crops more resilient to droughts is not presented. A case study could be usefull in this matter. [, France]	Noted. This is discussed in sections 3.7.1 and 3.7.3.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11909	62	15	62	16	Suggest to (very briefly) provide reasons why these specific examples were selected, i.e., they were particularly successful, or had positive impacts on a large number of people, or are unique, or can be implemented or larger scales, etc. [Hans Poertner and WGII TSU, Germany]	Accepted, included.
1319	62	15	62	16	How much area has been restored so far? Any estimate? [Oswaldo Lucon, Brazil]	Noted, this introduction was revised reflecting SOD review comments. The information about global area of degraded land which was restored is not available.
519	62	20	62	20	The refence is not relevant to quantify wind erosion at the global scale. It is not clear in this publication where this number comes from. [Beatrice Marticorena, France]	Accepted, text modified.
2845	62	24	62	24	Please consider inserting the following sentence after "…Spain(Lopez-Bermúdez, 1990): "For the badlands region in SE Spain, however, it was shown that biological soil crusts effectively prevent soil erosion (Lázaro et al., 2008)" [Bettina Weber, Germany]	Noted. Thank you for your suggestion. The text was revised with more emphasis on climate change, while limiting soil erosion extent information to global and regional aggregates, rather than providing erosion rate estimes for a few countries only. Case studies consider country level examples. We tried to have a regional balance in case studies to avoid that they repeatedly cover only a few country information. Information about different forms of desertification in Spain is given throughout the chapter, e.g. Section 3.3.
2847	62	24	62	24	Lázaro, R., Cantón, Y., Solé-Benet, A., Bevan, J., Alexander, R., Sancho, L.G., Puigdefábregas, J. (2008) The influence of competition between lichen colonization and erosion on the evolution of soil surfaces in the Tabernas badlands (SE Spain) and its landscape effects. Geomorphology 102: 252-266. [Bettina Weber, Germany]	Noted, thank you.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6699	62	25	62	31	In its present state, a clearer text on land degradation, soil erosion and sediment transport is missing. I would suggest to complete 3.8.8.1 and 4.4.1.1. subsections. I can further interact with you to clearly separate the two contributions from the following suggestion: "Land degradation by accelerated erosion (Lal, 2001; Poesen, 2018) can be studied with care from sediment transport in streams and sediment budgets. On a global scale, the flux of particles from rivers to the sea is estimated at 20 Gt of sediments per year (Ludwig and Probst 1998, Walling 2009, Ouillon 2018), i.e., 630 tonnes per second, which correspond on average to a net denudation of a ~6.2 cm thick layer on all soils every 1000 years (Inman and Jenkins 2003). This flux is of the order of 13 to 40% of the particles eroded in watersheds (total soil loss estimated between 40 and 75 Gt yr-1), the difference being explained by the massive downslope deposition of particles eroded within basins prior to their arrival at the marine interface, which is shaping landscapes (Robinson 1977, Walling and Webb 1996, Wilkinson and McElroy 2007, Warrick et al. 2014, FAO 2015). Despite its global importance, estimates of soil erosion differ significantly, depending on scale, study period and method used (Boix-Fayos et al., 2006, García-Ruiz et al., 2015). Sediment budgets have been strongly constrained by human settlements and other activities since man settled in the Neolithic (Hooke, 2000; Meybeck, 2003; Syvitski et al., 2005; Reusser et al. 2015). Human activities have both increased soil erosion (Milliman et al. 1987, Wilkinson 2005), and decreased sediment supply to the oceans due to dam retention (Syvitski et al., 2005; Syvitski and Kettner, 2011). The recent decrease in river particulate discharges due to reservoirs can reach 75% like in the Mekong River (Ha et al., 2018) or 95% like on the Nile and Ebro rivers. It is estimated at 25–30% of the total or 4–5 Gt yr−1 at global scale (Vörösmarty et al., 2003). In addition to changes which are attributed to anthropogenic actions such as intensification of agriculture, deforestation, forest fires, urbanization, river-training structures, bank revetments, climate change is strongly impacting erosion (Zhang and Nearing, 2005; Ziadat and Taimeh, 2013; Li and Fang, 2016). Enhanced erosion may be directly caused by an increase of precipitation, by increasing precipitation variability, even in the case of decreasing rainfall, due to increased frequency of large storms (Zhang and Nearing, 2005) which increases the susceptibility of soils to erosion (Vachtman et al., 2012), such as it was already shown in Algeria (Achite and Ouillon, 2007, 2016; Megnounif and Ghenim, 2016). However, soil management measures can be applied regionally to reduce soil erosion such as increasing the spatial extent of forests, rehabilitating degraded forests, erosion control,	Noted. Thank you for these valuable sources and suggestions We have taken these into account by including ideas on on climate change impacts on soil erosion with relevant references.
14443	62	38	62	38	Wind erosion process is one of the main reasons for land desertification, and need to add some information. [Qiang Zhang, China]	Accepted, added.
14445	62	38	62	38	Zhang, Z.C., Dong, Z.B., Qian, G.Q., 2017. An investigation into the processes and volume of dust emissions over gravel and sand deserts in northwestern China. Boundary-Layer Meteorology. 163,52535. Zou, X.Y., Li, J.F., Cheng, H., Wang, J.P., Zhang, C/L., Kang, L.Q., Liu, W., Zhang, F., 2018. Spatial variation of topsoil features in soil wind erosion areas of northern China. Catena, 167, 429-439. [Qiang Zhang, China]	Noted, thank you.
1445	62	39	62	41	The soil erosion estimates by Borelli et al. (2017) are predictions by a highly debated soil erosion model (i.e. USLE), rather than observations, hence they do not fit within the scope of this subsection on observed soil erosion trends. [Joris Eekhout, Spain]	Noted. We thank the reviewer for this comment. A clarification has been made to avoid confusion between real observations or measurements and estimates from equations. There is global lack of quantified observed data on soil erosion.
40603	62		62		explain the reason for the choice of these case studies. ¨Provide conclusions for each of them / confidence. What are lessons learnt that can be conveyed / key messages of this chapter? Some of these case studies read as "advertisements" for projects or practices and not like a balanced and objective assessment. Maps have low quality, and may present challenges (e.g. challenged national frontiers, names etc). Web sites not allowed as references for data. [Valerie Masson-Delmotte, France]	Accepted, explained. Maps updated accordingly.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26149	62	14	63	30	The success of Israel in restoring degraded desert lands, e.g., in the Negev, should be noted, either here or elsewhere in the Chapter. The research literature must include useful papers - for example: https://www.sciencedirect.com/science/article/abs/pii/S0140196303000879, or https://www.researchgate.net/publication/289519536_Rethinking_the_sustainability_of_Israel's_irrigation_practices_in_the_Drylands [Reid Detchon, United States of America]	Accepted. These papers consider urbanization and drip irrigation as response options, they were integrated into sections which are more relevant for them, i.e. 3.7.3 and 3.7.1.
6811	62	18	63	28	3.8.1. Case Study on Climate Change and Soil Erosion in Drylands is an important part of the desertification process and impact. From the general soil wind erosion process and changes, it should not be assessed in the case study section. It should be put it into section 3.2.4. Processes and Drivers of Desertification under Climate Change, section 3.3.1. Status and Trends of Desertification, section 3.3.2. Attribution of Desertification, section 3.6. Future Projections and others. [Changke Wang, China]	Rejected. We agree that the subject is important, this is why we are giving it a focused treatment here.
11907	62	14	81	11	These hotspots and case studies are very interesting and informative. However, they should be referred to elsewhere in the chapter to point the reader at them early on [Hans Poertner and WGII TSU, Germany]	Accepted, references to the case studies were made throughout the chapter.
12679	62	14	84	31	Section 3.8 describes and discusses "Hotspots and Case Studies" from different regions and countries but does not include any hotspot and case study from Arabian Peninsula and West Asia. Include "Hotspots and Case Studies" from these regions and subregions to reflect the situation and actions taken by regional countries on this important subject. [, Saudi Arabia]	Accepted, Arabian Peninsula is included in Oasis case study, Jordan is in Integrated Watershed Case study.
2293	62	20			Information is cited for a select few countries but it isn't clear why these countries were chosen. It certainly doesn't represent the global status of soil erosion as the heading outlines. Perhaps change the heading or cite global studies? [Nina Hunter, South Africa]	Accepted. We thank the reviewer for the suggestion. We have explained the choice of case studies.
2291	62	34			Wouldn't it be best to combine this with the information on soil and wind erosion in the opening two sentences? It seems disjointed to have this information at the end after mentioning wind and soil erosion at the beginning. [Nina Hunter, South Africa]	Thank you. Considered
24947	62	36			Organic matter particles are very prone to be eroded by wind. The organic particles left on soil surface are very light. Therefore in very arid places mulch inputs should be buried to avoid a dispersion by wind erosion. [Pascal Podwojewski, France]	Thank you. Considered
14447	63	4	63	4	Water erosion is more serious in Chinese Loess Plateau than Xinjiang, therefore, this information need to be added. [Qiang Zhang, China]	Noted. Thank you for your suggestion. The text was revised with more emphasis on climate change, while limiting soil erosion extent information to global and regional aggregates, rather than providing erosion rate estimes for a few countries only. Case studies consider country level examples. We tried to have a regional balance in case studies to avoid that they repeatedly cover only a few country information. Information about different forms of desertification in China is given throughout the chapter, e.g. Section 3.3.
14449	63	4	63	4	Feng, X.M., Fu, B.J., Piao, S.L., Wang, S., Ciais, P., Zeng, Z.Z., Lu, Y.M., Zeng, Y., Li, Y., Jiang, X.H., Wu, B.F., 2016. Revegetation in China's Loess Plateau is approaching sustainable water resource limits. Nature Climate Change volume 6, 1019–1022. [Qiang Zhang, China]	Noted, thank you.
32119	63	16	63	28	Sect 3.8.1.3. does not mention arid lands. This text seems to be misplaced. [Stephen Prince, United States of America]	Noted, the section was revised thoroughly.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32109	63	17	63	19	Clarify why retreating glaciers may increase erosion. Surely it would be the opposite? (Unless you mean glacier retreat is a symptom of global warming with global effects on desertification). [Stephen Prince, United States of America]	Accepted. We have deleted this sentence.
6687	63	17	63	19	It is very strange to read about glacier retreats in a section relative to arid lands. Could we find another, more suitable paragraph, to move this sentence? [Sylvain Ouillon, France]	Noted. We have deleted that particular sentence. Glacier-fed surface waters can be vital sources of water in arid areas, so in general, the mention of glacier retreat and how it affects land condition in drylands is within the scope of this chapter.
521	63	17	63	29	I would suggest to mention the emergence of dust sources at high latitudes and their possible expension under a changig climate (see Bullard et al., Rev. Geophys.,54, 447–485, doi:10.1002/2016RG000518., 2016) [Beatrice Marticorena, France]	Noted. Dust and climate change is discussed in Section 3.4. The chapter focuses on drylands. The suggested paper is outside the scope of the chapter.
8947	63	20	63	21	additional reference should be added as following: "Land use change and deforestation aggravates the effect of climate on erosion (Gutiérrez-Elorza, 2006; Kapović Solomun et al., 2018)." - Kapović Solomun, M., Barger, N., Keesstra, S., Cerda, A., Marković, M. 2018. Assessing land condition as a first step to achieving Land Degradation Neutrality: A case study of the Republic of Srpska, Environmental Science and Policy 90 (2018), 19-27. [Jean-Luc Chotte, France]	Noted. This section was re-organized. the references added.
8949	63	20	63	21	There are another research that can support this sub-chapter. "Climate change, desertification, and lack of water resources or food supply can be eventually successfully addressed only if soil sustainability issues are solved (Cerda et al., 2017)" - Cerdà, A., Rodrigo-Comino, J., Giménez-Morera, A., Novara, A., Pulido, M., Kapović-Solomun, M., Keesstra, S. D., 2018. Policies can help to apply successful strategies to control soil and water losses. The case of chipped pruned branches (CPB) in Mediterranean citrus plantations. Land Use Policy, 75, 734-745. [Jean-Luc Chotte, France]	Noted. This is in line with our discussion. Reference added.
6691	63	23	63	26	The first sentence extracted from Nabi et al. (2008) on the Warsak dam in Pakistant is fully informative and clear. But the next sentence is very vague: two dams had their lifespan reduced by more than 10 years, but after a period of which duration? Suggestion to deleted the second sentence and keep the first one with the ref to Nabi et al. at the end. [Sylvain Ouillon, France]	Noted, the section was revised, this sentence dropped.
6693	63	23	63	26	The shift of rain events in dryland areas of Algeria during the year also caused severe erosion. For example, the increase of temperature and decrease of precipitation over 40-years, accompanied with a shift towards an earlier onset of first rains during summer, was found with cascading effects on hydrology and vegetation that induced to almost double the sediment flux every decade from the 1970s to the 2000s in a semiarid basin of Western Algeria (Achite and Ouillon, 2016. Recent changes in climate, hydrology and sediment load in the Wadi Abd, Algeria (1970-2010). Hydrology and Earth System Sciences, 20, 1355-1372, doi:10.5194/hess-20-1355-2016). [Sylvain Ouillon, France]	Accepted, this case study has been joined to Green walls case study. Your comment is taken into consideration there.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6689	63	26	63	28	It's perfectly true. However, erosion does not depend only on precipitation volumes and intensity (I put the same comment for the same report, page 15, lines 9-11). The shift of rain events in dryland areas during the year may cause severe effects on erosion. For example, the increase of temperature and decrease of precipitation, accompanied with a shift towards an earlier onset of first rains during summer over 40-years, was found with cascading effects on hydrology and vegetation that induced to almost double the sediment flux every decade from the 1970s to the 2000s in a semiarid basin of Western Algeria (Achite and Ouillon, 2016. Recent changes in climate, hydrology and sediment load in the Wadi Abd, Algeria (1970-2010). Hydrology and Earth System Sciences, 20, 1355-1372, doi:10.5194/hess-20-1355-2016) [Sylvain Ouillon, France]	Accepted, included to Algeria case study in Green Walls case study.
25067	63	30	63	44	Here and in several other places, restoration and rehabilitation are illustrated as important measures to combat desertification. However, it is not clear the difference between restoration and rehabilitation. It's better to clarify. The book (Liu J., Clewell A., 2017. Management of Ecological Rehabilitation Projects. Science Press. Beijing. ISBN：9787030551368.) provides clear definations for restoration and rehabilitation. "The process of assisting the recovery of an impaired ecosystem to a state that more nearly emulates a historical ecological reference. If full recovery of ecological attributes is attained, the rehabilitated ecosystem can also be said to have undergone ecological restoration. If ecological restoration is the specified intent, then rehabilitation indicates a lesser degree of recovery in which one or more ecological attributes relative to the ecological reference are not fully attained at the time of project completion and are not likely to recover spontaneously thereafter." [Junguo Liu, China]	Thank you for your very relevant comment and we take note.
31743	63	31	63	31	There is a much more focus on the problematic than on the solution, the object of this part [WAFAE BADI, Morocco]	Noted. Case studies are developed to illustrate both hotspots of succesful stories
30919	63	31	63	36	50 million hectares areas threatened by degradation due to desertification and water erosion, according to the Ministry of Agriculture and Rural Development (MADR 2011), see (Mostephaoui, Merdas, Sakaa, & Hanafi, 2013) [Saifi Merdas, Algeria]	Accepted, it's included in the case study of the green dam
14451	63	31	63	44	There are many researches on wind and water erosion in north China, which need to be added [Qiang Zhang, China]	Noted. Thank you for your suggestion. The text was revised with more emphasis on climate change, while limiting soil erosion extent information to global and regional aggregates, rather than providing erosion rate estimes for a few countries only. Case studies consider country level examples. We tried to have a regional balance in case studies to avoid that they repeatedly cover only a few country information. Information about different forms of desertification in China is given throughout the chapter, e.g. Section 3.3.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14453	63	31	63	44	Zhang, Z.C., Dong, Z.B., Wen, Q., Jiang, C.W., Wind regimes and aeolian geomorphology in the western and southwestern Tengger Desert, NW China. Geological Journal, 2015, 50(6), 707–719. Feng, X.M., Fu, B.J., Piao, S.L., Wang, S., Ciais, P., Zeng, Z.Z., Lu, Y.M., Zeng, Y., Li, Y., Jiang, X.H., Wu, B.F., 2016. Revegetation in China's Loess Plateau is approaching sustainable water resource limits. Nature Climate Change volume 6, 1019–1022. Zou, X.Y., Li, J.F., Cheng, H., Wang, J.P., Zhang, C/L., Kang, L.Q., Liu, W., Zhang, F., 2018. Spatial variation of topsoil features in soil wind erosion areas of northern China. Catena, 167, 429-439. Tuo, D.F., Xu, M.X., Gao, G.Y., 2018. Relative contributions of wind and water erosion to total soil loss and its effect on soil properties in sloping croplands of the Chinese Loess Plateau. Science of The Total Environment,633, 1032-1040. [Qiang Zhang, China]	Noted. We included some of these references in relevant places. Some of these references do not have direct link to climate change, but could be valuable sources for wind erosion discussion.
6697	63	32	63	36	Analysis of the shift rate of climate zones in Algeria from 1951 to 2005 found a gradual but significant expansion of the surface area of the desert zone at an approximate rate of 650 ± 160 km2/year along with the abrupt shrinking, by approximately 30%, at a rate of 1086 ± 270 km2/year, of the warm temperate climate zone surface area (Zeroual A., Assani A.A., Meddi M., Alkama R., 2018. Assessment of climate change in Algeria from 1951 to 2098 using the Köppen–Geiger climate classification scheme, Climate Dynamics, doi:10.1007/s00382-018-4128-0) [Sylvain Ouillon, France]	Accepted, added in case study of green belt
30921	63	42	63	44	A recent study about wind erosion can be cited . (Houyou, Bielders, Benhorma, Dellal, & Boutemdjet, 2016) https://doi.org/10.1002/ldr.2295 [Saifi Merdas, Algeria]	Accepted, added in case study of green belt
11911	63	31	64	16	How is this case linked to the one described in section 3.8.2.2 Green Belt in Algeria? [Hans Poertner and WGII TSU, Germany]	Accepted, these are now combined.
31747	63	31	69	32	Intra/inter regional unbalance in citing case studies; please avoid a lot of self authors/countries citing. You can find hereafter some useful links http://cedarekmp.net/arabma/docs/MA_final%20full%20Report_Low.pdf https://apps.icarda.org/wsInternet/wsInternet.asmx/DownloadFileToLocal?filePath=Working_Paper_Series/OASIS/OASIS_2_Morocco.pdf&fileName=OASIS_2_Morocco.pdf [WAFAE BADI, Morocco]	Accepted, Other case studies from other regions have been added, to ensure regional balance. We could not open th elink you sent. But information on oases in Morocco is now featured in the Oases case study.
39189	64	1	64	1	Presumably Figure 3.11 will be higher quality. [, United States of America]	Noted, the figure has been removed
30923	64	2	64	3	A study conducted in central steppe rangelands by (Mostephaoui, Merdas, Sakaa, & Hanafi, 2013) Journal Algérien Des Régions Arides, 11, 1–17. estimates estimates that each year there is a loss of 7 tonnes per hectare per year of soils. [Saifi Merdas, Algeria]	Accepted, included in green wall case study.
4155	64	7	64	7	Please, improve the quality/resolution for figure 3.10. The lengend must be must be legible and written in english [Eugenia Gayo, Chile]	Accepted, this figure is removed
11913	64	8	64	9	It is nearly impossible to read this map. the legend is too small, locations cannot be read, and the reader has to know exactly the shape of Algeria or northern Algeria to understand what is shown here. Suggest to add also a larger map of northern Africa or at least of Algeria as a whole (e.g., as in Figure 3.13), and indicate the section that is zoomed in here. Also, please include more explanation in the legend such that the figure can stand alone. Please streamline the layout of this map with other maps, such as Figure 3.13 (even if the scale might be different) [Hans Poertner and WGII TSU, Germany]	Accepted, this figure is removed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
6695	64	10	64	16	In addition: Zones of erosion control are prioritized per water basin using erosion models, coupled or not with sediment transport models (Zettam et al., 2017, Toubal et al., 2018). Toubal A.K., Achite M., Ouillon S., Dehni A., 2018. Soil erodibility mapping using the RUSLE model to prioritize erosion control in the Wadi Sahouat basin, North-West of Algeria, Environmental Monitoring and Assessment, 190, 210. doi:10.1007/s10661-018-6580-z. Zettam A. et al. 2017. Modelling Hydrology and Sediment Transport in a Semi-Arid and Anthropized Catchment Using the SWAT Model: The Case of the Tafna River (Northwest Algeria), Water, 9, 216, doi:10.3390/w9030216 [Sylvain Ouillon, France]	Noted, Thank you for your comment, the case study has been removed
31745	64	12	64	15	Please add references for these initiatives [WAFAE BADI, Morocco]	Thank you for your comment, the case study has been removed
30925	64	14	64	16	More details about reforestation in Algeria can be found in (Merdas, Mostephaoui, & Belhamra, 2017) REFORESTA, 22(3), 116. https://doi.org/10.21750/REFOR.3.10.34 [Saifi Merdas, Algeria]	Noted. Thank you for your comment, the case study has been removed.
27041	64	18	64	27	How about the increased need for fertilizers in the absence of tillage that is mentioned elsewhere in this report? Please address this issue here as well. [, Germany]	Accepted.
14455	64	18	65	32	Water erosion in the arid land can provide sediment provenance. [Qiang Zhang, China]	Noted. Correct. But the case study does not cover that aspect
14457	64	18	65	32	Yan, P, Li, XM, Ma, YF. Wu, W, Qian, Y. 2015. Morphological characteristics of interactions between deserts and rivers in northern China. Aeolian Research. 19: 225-233. Hu, FG, Yang, XP. 2016. Geochemical and geomorphological evidence for the provenance of aeolian deposits in the Badain Jaran Desert, northwestern China. Quaternary Science Reviews 131: 179-192. [Qiang Zhang, China]	Noted.
11915	64	29	65	10	Is this case study somehow linked to the one describing the Green Belt of Turkey later on? [Hans Poertner and WGII TSU, Germany]	No. This case study is specific and old one in Turkey assessing "The Greening Desert of Karapınar.". The green belt case study was dropped, with its core ideas added to the main text.
24949	64	28			In arid environments, for permanent crops in sandy soils, even ploughing is not considered as a sustainable practice to maintain soil organic matter contents and promoting the risk of aeolian erosion, it is often an imperative necessity i) to limit the competition of weed, ii) to brake the crust and increase the water infiltration, and iii) more important to brake the pore connectivity, and therefore limit the water capillary rise and the evapotranspiration. Example: With less than 200 mm rainfall per year, olive orchards with sandy soils in the Jeffara coastal plain of South Tunisia is sustainable because of intense tillage, otherwise the trees are dying. But tillage is reducing dramatically soil organic carbon contents, and promote root necrosis and limit the production of old trees and therefore this practice generates other constraints. Only long term trials would be able to promote a more sustainable form of land practice. [Pascal Podwojewski, France]	Noted. We understand the point raised by the reviewer. The case study corresponds to a location where precipitation is far greater than the ones refered by the reviewer. Here No Tillage has proven to be an effective way to deal with erosion.
2295	65	12			Does the "Green wall" refer to the experience in China? If so please mention this term in the section (as the other sections do) and use the word "respectively" in section 3.8.2 (once the information is in the correct order) to indicate that each "green" thing refers to the specific regions. Also in the heading it is "Green Wall" but in the text it is "Green Great Wall" - best to use one approach [Nina Hunter, South Africa]	Noted, these are clarified under each sub-section.
11917	65	13			Quantify "many years" [Hans Poertner and WGII TSU, Germany]	Accepted, clarified.
5089	66	1	66	1	Suggest deletion of "Figure 3.11" as this seems to be a wrong citation. [, Japan]	We have corrected it.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11919	66	4	66	6	Please explain: do these tree species occur naturally in the area or are they introduced? Why were they selected? [Hans Poertner and WGII TSU, Germany]	These species were selected because they are resistant to arid continental climate conditions and/or some of them are native species in the district.
32139	66	12	66	12	There are no discussions of the effects of these programs. If they are elsewhere in the Report, it would be useful to cite the sections. [Stephen Prince, United States of America]	accepted and added some discussion.
32131	66	12	66	15	The issue of green walls etc. is concerned with reducing the effects of NATURAL sandification (the Chinese term) or dune encroachment. It does not involve anthropogenic degradation and is therefore not desertification as defined in this Report (mostly!). Here is a quote on the Great Green Wall of the Sahara, from R. Bellefontaine, M. Bernoux, B. Bonnet, A. Cornet, C. Cudennec, P. D'Aquino, I. D., S. Jauffret, M. Leroy, M. Mainguet, M. Malagnoux, M. Requier-Desjardins, M. of, & CSFD. (2011). The African Great Green Wall project What advice can scientists provide? A summary of published results. Retrieved from http://agritrop.cirad.fr/567880/1/document_567880.pdf Errors: 1. The desert is a Sahelian ecosystem disease. The Sahara is sometimes considered as a kind of cancer that spreads into surrounding areas whereas it is actually a perfectly healthy ecosystem that existed long before the birth of humankind and that, like other deserts worldwide, contributes to the Earth's diversity and wealth (biological, landscape, cultural). It is not in any way the image of an unhealthy environment. Global warming has modified its extension pattern in the past, and current climatic changes could lead to a gradual shift in the northern and southern boundaries of the desert. 2. The Sahel is being invaded by a sand sea. The idea that a gradually advancing sea of Saharan sand dunes is relentlessly invading the Sahel is also unfounded. This is not the pattern that scientists have noted. Sand has been shifting in different areas, sometimes covering infrastructures or dwellings when this movement occurs in their vicinity. These are manageable local and regional phenomena. Hence, this is not a continent-wide movement trend that should be stopped like an invader. Desertification is a diffuse local phenomenon that does not always have its most severe impact in areas bordering the desert. [Stephen Prince, United States of America]	Noted and revised
523	66	12	66	70	The different case studies listed in this section are at very different level of developement and so is the contente of the different sections. [Beatrice Marticorena, France]	Noted. Effort has been done to improve all.
1457	66	17	66	33	Some key references about the successful experiences of desertification control in China should be added, such as the win-win measures of developing ecological industry in desertification regions. For example, Cao,S.X., Liu, Y.J., Yu,Z.Q., 2018: China's Successes at Combating Desertification Provide Roadmap for Other Nations. Environment: Science and Policy for Sustainable Development, 60, 16-24. [Duanyang Xu, China]	accepted and added.
3479	66	18	66	19	The description of arid and semiarid area of China is misleading. We know that only the region of Xinjiang covers more than 1.6 million km2, please check the numbers. [Jianqi Sun, China]	accepted and revised it

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32129	66	17	67	11	This does not review the large literature on the China Green Wall and its relationship to degradation. There are NO citations to literature - even that support the views expressed. The concept is now largely considered to have been ill-conceived (see Wang et al. 2010, below). Most of the problem is caused by natural sand movement, not human activities. It is therefore not desertification in the sense of this Report. The political account here is rebutted by Jiang 2016 (below). Given Chinese sensitivities and their probable right to review this, a more abbreviated text would be better, noting the Green Wall and its known success in reducing local dust storms. The rest of the story might be ignored (but the 2 citations might survive review!). Wang, X. M., Zhang, C. X., Hasi, E., & Dong, Z. B. (2010). Has the Three Norths Forest Shelterbelt Program solved the desertification and dust storm problems in arid and semiarid China? Journal of Arid Environments, 74(1), 13–22. https://doi.org/10.1016/j.jaridenv.2009.08.001 Jiang, H. (2016). Taking Down the “Great Green Wall”: The Science and Policy Discourse of Desertification and its Control in China. In R. Behnke & M. Mortimore (Eds.), The End of Desertification? Disputing Environmental Change in the Drylands (pp. 513–536). Berlin: Springer. https://doi.org/10.1007/978-3-642-16014-1_19 [Stephen Prince, United States of America]	Accepted and added the new literatures
25241	66	12	70	9	The cases presented here are large-scale political initiatives with very diverse outcomes, including controversial aspects such as resettlements, introduction of alien species, overuse of water resources and others more. The way they are presented here does not seem adequate for a scientific report as there is no critical discussion and only very few scientific sources are provided. Recommended to delete this section. [Alexander Erlewein, Germany]	Noted. We have included critical discussion and more scientific sources. This topic is of great importance and relevance to many ongoing activities for combatting desertification.
26667	66	12	70	9	This section needs more critical discussion of the fundamental concept of green walls etc. as barriers to desertification, which is assumed to spread geographically [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, text on green walls and how they interact with climate change and desertification is included.
3579	66	25			delete quotation marks in Land Degradation Neutrality… they are not used elsewhere [Cordula Ott, Switzerland]	Accepted and deleted.
11921	66	34			"What is meant with "fifth monitoring"? [Hans Poertner and WGII TSU, Germany]	Noted, It has been revised.
11923	66	40			"4.86 10^10" this number is odd; please correct it. Also, for better clarity to the reader, could this be converted into metric tonnes? [Hans Poertner and WGII TSU, Germany]	Accepted, changed.
11925	66	40			It is not clear which "sandy area" is referred to here. Please explain [Hans Poertner and WGII TSU, Germany]	Accepted.
16515	66				Please add a case study of Mongolia in 3.8.2. [, Republic of Korea]	Noted, and mentioned in the introduction.
16517	66				The file name is 'Mongolia case study.docx'. [, Republic of Korea]	Noted, and added briefly to introduction.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
16655	66				It should be better ro rewrite like following in the 3.8.2. 3.8.2. Case study on Green Walls, Green Dams and Green Belts Land degradation and desertification status of Mongolia In recent years, desertification and degradation of natural vegetation have become an important issue all over the world particularly in Mongolia. Desertification has been defined by the United Nations Convention on Combatting Desertification as land degradation processes in arid, semi-arid, and dry subhumid zones caused by various factors, including climatic variation and human activities. Land degradation comprises of the major processes of desertification occurs in drylands, i.e. where the aridity index is less than 0.65. Since up to 90 % of Mongolia's territory belongs to hyper-arid, arid, and semi-arid areas, most of the country is pastureland, and is estimated about the amounts that are degraded rapidly (Figure 1). In Mongolia, there are different types of desertification due to frequent droughts, degradation of vegetation cover, loss of soil nutrients and fertility in arable lands, and increase of deforested and denuded land. In addition to the frequent droughts, increasing grazing pressure on the pasture areas threatens the fragile environment of Mongolia that some areas have already exceeded the conditions for sustainable development and experienced desertification (Kang and Hong, 2016; Kang et al., 2015a; 2015b). Figure 1. Rate of land degradation and desertification (Tsogtbaatar,et al., 2015; Tsogtbaatar, 2004) As a result of this latter study 72 % of Mongolian territory is deserted in big or small scale out of which 23 % is slightly, 26 % is moderately, 18 % is heavily, and 5 % is very heavily deserted (Tsogtbaatar,et al., 2015). Therefore, the desertification process is aggressive in Mongolia and has reached the point of negatively affecting the population, types of enterprises, and market flow. In line with the 'National Action Plan to Combat Desertification 2010-2020', which was approved by the Government of Mongolia in 2010, a nationwide assessment and mapping	Noted, and mentioned in the introduction.
39191	67	14	67	14	Replanting of forests, rather than reconstruction. [, United States of America]	Accepted, We change by replanting
883	67	16	67	16	Barrage' in French means 'dam', but it can also mean 'obstacle' and 'blockage', which makes more sense in this case. But I would actually translate it with 'green belt'. [Tor A. Benjaminsen, Norway]	Noted. Thank you for your comment. But in Algeria the concept green dam is the one that was used to talk about the "Barrage Vert"
39193	67	21	67	21	Use people rather than hab. [, United States of America]	Accepted. We corrected
1829	67	21	67	22	Is the range 3-92 hab/km2 correct? Is there a typo – should it be 9, instead of 92? [William Lahoz, Norway]	Accepted. Modified accordingly.
32133	67	31	67	31	Is this a citation? If it supports the statements here about % successes, and is methodologically credible, then it is very important to cite fully. [Stephen Prince, United States of America]	Accepted, added. Thank you for your comment. the present results are taken from a report of the services in charge of the forests in Algeria.
11927	67	13			Please explain whether and how this case study is related to the hotspot in Algeria described in section 3.8.1.4.1 [Hans Poertner and WGII TSU, Germany]	Accepted. The two case studies are linked, the green dam is also a fight against soil erosion. So we combined the 2 studies
32135	68	4	68	4	Is it known if this program had any effect on desertification control? [Stephen Prince, United States of America]	Noted. That case study were dropped to have more balanced regional coverage. Some ideas included in Section 3.7.3. where the impacts are included now.
26279	68	9	68	9	(now the Ministry of Agriculture and Forestry) should be replaced with (later Ministry of Forestry and Water Affairs and now the Ministry of Agriculture and Forestry) [Ahmet Şenyaz, Turkey]	Accepted and we have changed the sentence.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
26281	68	18	68	18	infertile forests should be replaced with degraded forests [Ahmet Şenyaz, Turkey]	Accepted and we have changed the sentence.
26283	68	22	68	22	"establishing the planting of saplings" should be replaced with "planting saplings" [Ahmet Şenyaz, Turkey]	Accepted and we have changed the sentence.
26277	68	4	69	14	Afforestation and Erosion Control Mobilization Action Plan proposed a large scale afforestation, erosion control and rehabilitation activities and spread across the country. Heading must be "Afforestation and Erosion Control in Turkey" instead. [Ahmet Şenyaz, Turkey]	Accepted and we have changed the sentence.
11929	68	4			It should be explained whether this case is linked to the one in section 3.8.1.4.3 [Hans Poertner and WGII TSU, Germany]	Accepted, those were now joined.
11931	68	15			Please provide the equivalent amount in Euros or Dollars [Hans Poertner and WGII TSU, Germany]	We have noted this comment and provided its Dollar equvialent as "The action plan, with a total cost of more than $1.8 billion, was applied from 2008 to 2012 (http://www.forestlandscaperestoration.org/afforestation-and-erosion-control-turkey-national-effort)."
11933	69	1	69	4	This figure is unnecessary and does not add any information that is not already delivered by the text. Suggest deleting [Hans Poertner and WGII TSU, Germany]	Accepted.
26285	69	6	69	6	"through the program" should be deleted [Ahmet Şenyaz, Turkey]	Accepted.
26287	69	11	69	11	schools get life' might be replaced with 'let the schools spring to life" [Ahmet Şenyaz, Turkey]	Accepted and we have changed the sentence.
2849	69	16	69	16	The great green wall was already mentioned at the end of section 3.8.2.2. Perhaps it makes sense to combine both sections. [Bettina Weber, Germany]	Rejected : These are 2 different projects, one is for one country and the other is an initiative of several countries that have taken as an example the first project
32137	69	16	69	16	Some citations on this would be helpful [Stephen Prince, United States of America]	Accepted, references added
525	69	16	70	9	Compared to the other case studies, this section appears more poltician than scientific. The references that sustain the text are not from the scientific litterature. It maily describes the intention of the project and nothing is said in terms of realization. [Beatrice Marticorena, France]	Noted. The discussion on the impacts and shortcomings included.
885	69	16	70	9	The Great Green Wall is a gigantic project that in view of past experiences with large-scale afforestation projects in the Sahel will be a massive waste of money. Very few trees that are planted tend to survive unless they are watered by hand. In addition, the project may potentially dispossess pastoralists and possibly small-scale farmers from grazing areas and farmland. For a critique of this project and a review of 'desertification' in the West African Sahel, see Benjaminsen & Hiernaux (2019) From Desiccation to Global Climate Change: A History of the Desertification Narrative in the West African Sahel, 1900-2018, to be published in Global Environment in March. [Tor A. Benjaminsen, Norway]	Noted. Thank you for your comment. Indeed, reforestation programs in the arid regions of the Sahel and North Africa have been poorly studied and have cost a lot of money without a significant success.Today, for the Great green wall, the actions undertaken are development projects and the donors act according to their strategies and especially their budget envelopes. We will take into account your publication
4157	70	1	70	1	Please, improve the quality/resolution for figure 3.15 (e.g. re-done it by using satellite images). [Eugenia Gayo, Chile]	Accepted : The map is changed
39195	70	1	70	1	This map of Africa does not have South Sudan listed but it does have Sudan listed. Sudan's borders include territory that is now the country of South Sudan. This should be changed. [, United States of America]	Accepted : The map is changed
26669	70	1	70	1	The map needs updating/replacing as it does not include South Sudan as an independent country [John Morton, United Kingdom (of Great Britain and Northern Ireland)]	Accepted : The map is changed
12755	70	1	70	1	Figure 3.15 should be graphically improved [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Accepted : The map is changed
11935	70	1	70	2	Provide the source of this map. Remove country boders [Hans Poertner and WGII TSU, Germany]	Accepted : The map is changed

Comment No	From Page	From Line	To Page	To Line	Comment	Response
32141	70	12	70	13	Unfinished thought? Presumably the point is that fire opens land to invasion. Cite Figure 3.17? [Stephen Prince, United States of America]	Noted, after careful examination, we think the sentence is complete.
39197	70	17	70	17	Mesic will need to be defined. [, United States of America]	Accepted, changed to humid
8951	70	17	70	20	Invasive species and weeds expansion are documented in the research Kapovic Solomun et al., 2018, related to moesic region and abandoned agricultural land due to past conflict and migrations. Suggestion is:after "Compared to more mesic regions, the number of species that succeed in invading dryland areas is low (Bradley et al., 2012), yet they have a considerable impact on biodiversity and ecosystem services (Le Maitre et al., 2011, 2015; Newton et al., 2011). Expansion of invasive species and weeds is important land degradation driver documented on abandoned agricultural land in post conflict society due to migrations in Bosnia and Herzegovina beside dryland (Kapović Solomun et al., 2018). - Kapović Solomun, M., Barger, N., Keesstra, S., Cerda, A., Marković, M. 2018. Assessing land condition as a first step to achieving Land Degradation Neutrality: A case study of the Republic of Srpska, Environmental Science and Policy 90 (2018), 19-27. [Jean-Luc Chotte, France]	Rejected: Thanks for the suggestion, but we feel that this reference is not completely within the scope of the section. which is on drylands.
32143	70	21	70	22	Presumably Fig 3.16 refers to drylands only? Add a note. [Stephen Prince, United States of America]	Accepted: You're right, we modified the legend; "Difference between the number of invasive alien species (n=99) from Bellard et al. (2013) predicted to occur by 2050 (under A1B scenario) and current period "2000" within the dryland areas."
3833	70	23	70	24	The impact of population growth upon the development of invasive species is stated unambiguously here, with inverse consequences being illustrated in sections 3.8.3.2-3. Yet section 3.8.3.4, when considering ways of dealing with invasive weeds, does not mention any action concerning population growth. [Philippe Waldteufel, France]	Accepted: the effect of population growth on the development of invasive plant species is not clearly reported in the literature. Therefore, we deleted population growth as main driver (Page 70 L23).
32145	70	25	70	25	Are there any known climate-related aspects to these examples? There are only comments under USA. If not, why are they mentioned? Notwithstanding, these examples are very useful and would be very suitable for a separate publication. [Stephen Prince, United States of America]	Rejected. The examples L25 are related to climate aspects (variability in rainfall, elevated temperature, CO2 concentration).
3665	70	11	74	43	merge 3.8.4.2 and 23.8.4.3 and 3.8.3.4 in one subchapter… or in three cases studies: Ethiopia, Mexico, US [Cordula Ott, Switzerland]	Accepted, now the cases presented by country as reviewer suggested.
23803	70	11	74	43	The choice of case studies for invasive plant impacts on drylands seems skewed. There are two case studies from North America and one from Africa. The chpater authors could consider case studies from other continents such as Asia, Australia and South America which have extensive drylands. Lantana camara is a highly invasive shrub that has spread globally but especially in drylands in India with possible consequences for desertification. The authors could consider this invasive from Asia and other invasives from the other two continents. [, India]	Accepted: we added the cases in Pakistan, therefore we had four cases in three continents (Asia, Africa and America).

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11939	71	12	71	15	It does not become very clear why fire promotes invasive species [Hans Poertner and WGII TSU, Germany]	Accepted: We have now added another example to show how fire promotes invasions. “Conversely, fire may promote plant invasions via a number of mechanisms (by reducing cover of competing vegetation, destroying native vegetation and clear a path for invasive plants or creating favorable soil conditions) (Brooks et al., 2004, Grace et al., 2001 and Keeley 2012).” Keeley, J. E., and Brennan, T. J. (2012). Fire-driven alien invasion in a fire-adapted ecosystem. Oecologia 169, 1043–1052. doi:10.1007/s00442-012-2253-8. Brooks, M. L., C. M. D'Antonio, D. M. Richardson, J. M. DiTomaso, J. B. Grace, R. J. Hobbs, J. E. Keeley, M. Pellant, and D. Pyke. 2004. Effects of invasive alien plants on fire regimes. BioScience 54:67 Grace, J. B., M. D. Smith, S. L. Grace, S. L. Collins, and T J. Stohlgren. 2001. Interactions between fire and invasive plants in temperate grasslands of North America. Pages 40-65 in K. E. M. Galley and T. P Wilson, editors. Proceedings of the invasive species workshop: the role of fire in the control and spread of invasive species. Miscel- laneous publication 11. Tall Timbers Research Station, Tallahassee, Florida
11937	71	18	71	20	remove country borders from map [Hans Poertner and WGII TSU, Germany]	Accepted: We have now modified Fig 3.16 and removed country borders from map
4159	71	19	71	20	Please, improve the quality/resolution for figure 3.16 (I barely distinguish Australia). [Eugenia Gayo, Chile]	Accepted: We have now modified Fig 3.16 and improved the resolution
39199	71	20	71	20	In caption to Figure 3.16, it is not at all clear what n=99 means or implies. [, United States of America]	Accepted: n=99 means the number of invasive alien species that were modelled in this figure. “Difference between the number of invasive alien species (n=99) from Bellard et al. (2013)) predicted to occur by 2050 (under A1B scenario) and current period “2000” within the dryland areas.”
1831	71	26	71	26	Perhaps the authors could give the common name of the first invasive plant mentioned. [William Lahoz, Norway]	Accepted, done.
11945	71	27	71	28	This statement needs a reference [Hans Poertner and WGII TSU, Germany]	Accepted, added.
14685	71	30	71	30	Suggest briefly listing or describing the health risks. [, Canada]	Accepted, added.
11947	71	26	72	8	How are these two examples linked to climate change? [Hans Poertner and WGII TSU, Germany]	Noted. Invasive weeds are known to take advantage of changing environment due to climate change i.e. increased temperature (atmosphere and soil), moisture extremes (flooding and dryness), elevated CO2 (see Kathiresan and Gualbert, 2016)
32149	71	25	74	43	3.8.3.2. to 3.8.3.4. Would it not be easier to follow if the material in all 3 sections were to be gathered together under one heading? [Stephen Prince, United States of America]	Accepted: the cases presented by country as reviewer suggested
11699	71	20			Fig 3.16 not rendered well - fix plotting problems. [Paul Dirmeyer, United States of America]	Accepted: We have now modified Fig 3.16 and improved the resolution
3663	71	25			reconsider Title? invasive species in country-cases.. [Cordula Ott, Switzerland]	Rejected: all the case studies start with Case study on
11941	71	26			What plant type is Parthenium? [Hans Poertner and WGII TSU, Germany]	It is an annual herbacious weed which belongs to the Asteracea family. A statement added to descibe the two invasive species in Ethiopia
11943	71	26			Damage to what? [Hans Poertner and WGII TSU, Germany]	Noted. Ecosystem especially biodiversity
39201	72	1	72	1	Why is Parthenium hysterophorus a health hazard? [, United States of America]	It contains a toxin called Parthenin (a glycoside) which causes dermatitis skin allergies, respiratory problems, eye irritation on human and livestock

Comment No	From Page	From Line	To Page	To Line	Comment	Response
23495	72	9	72	9	This section on United States could also mention grassland-shrubland transition with mesquite in the Chihuahuan desert. [Nicholas Webb, United States of America]	Noted. We discussed on sagebrush and tamarisk, we are limited by page limits to be able to cover this in sufficient detail.
2851	72	15	72	15	Please consider adding the following sentence after "…cheatgrass (Pilliod et al., 2017; Balch et al., 2013).": "Intact biological soil crusts have been shown to effectively prevent the germination of cheatgrass (Slate et al., 2018)." [Bettina Weber, Germany]	Accepted, related idea included further down.
2853	72	15	72	15	Slate, M.L., Callaway, R.M., Pearson, D.E. (2018) Life in interstitial space: Biocrusts inhibit exotic but not native plant establishment in semi-arid grasslands. Journal of Ecology. DOI: 10.1111/1365-2745.13117 [Bettina Weber, Germany]	Noted.
11949	72	1			What makes Parthenium a health hazard? [Hans Poertner and WGII TSU, Germany]	It contains a toxin called Parthenin (a glycoside) which causes dermatitis skin allergies, respiratory problems, eye irritation on human and livestock
4161	73	1	73	1	Please, improve the quality/resolution for figure 3.17 [Eugenia Gayo, Chile]	Noted. Figure dropped.
23497	73	6	73	6	It would be good to clarify "accelerated soil erosion" as "accelerated wind and water erosion" in figure caption as both processes respond to the changes described. [Nicholas Webb, United States of America]	Noted. Figure dropped.
24951	73	10			Which Prosopis? Prosopis africana is probably not an alien. [Pascal Podwojewski, France]	Accepted, clarified, this is Prosopis juliflora.
6631	73	13			Parthenium in italics [, Mexico]	Accepted, done.
32151	74	16	74	16	Section number is out of sequence. Should it be 3.8.4.4.? [Stephen Prince, United States of America]	Rejected: the error was in the number 3.8.4.3 Page 73 L9. The correct number is 3.8.3.3.
2855	74	40	74	40	Please consider adding the following sentence after "…Pellant et al., 2004).": "Also biological soil crust protection may be an effective measure to reduce cheatgrass germination, as biocrust disturbance has been shown to be a key factor promoting germination of non-native grasses (Hernandez and Sandquist, 2011)." [Bettina Weber, Germany]	Accepted.
2857	74	40	74	40	Hernandez, R.R., Sandquist, D.R. (2011): Disturbance of biological soil crust increases emergence of exotic vascular plants in California sage scrub. Plant Ecology 212: 1709-1721. [Bettina Weber, Germany]	Accepted.
11951	74	30			reseeding of native species? [Hans Poertner and WGII TSU, Germany]	Accepted.
4163	75	14	75	15	Please, improve the quality/resolution for figure 3.18 [Eugenia Gayo, Chile]	Accepted, done.
4165	75	14	75	15	The location for Siwa must be highlighted within the map. A general context picture for the oasis could also accompany this map (showing how this oasis contrasts with the hyperarid landscape and/or the dune field). [Eugenia Gayo, Chile]	Noted, photos of oases from across the region provided.
11953	75	15	75	16	Provide a source of this map [Hans Poertner and WGII TSU, Germany]	Noted, that map was replaced, The new one has a source.
32153	75	16	75	16	Is "Siwa" in the NE the place to which this refers? Mark it much more prominently and label it "Siwa Oasis". [Stephen Prince, United States of America]	Accepted, done.
27043	75	21	76	1	Reference is missing for salinization due to water mismanagement, improper drainage system and climate warming. [, Germany]	Accepted, included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25069	75	1	78	27	I feel some of Figures 3.21-23 are quite redundant and formats of the figures are quite bad. It's better to remove a few figures or at least improve them. To improve oases environmental condition, there is a need to shift the generation of sustainability knowledge from a disciplinary, linear "tree" model to an interdisciplinary "web" model. In a recent paper published in Nature Sustainability, we use the Heihe River Basin (HRB) located in northwest China to explain such a model shift. I copied some texts for your Liu J., Bawa K. S., Seager T., Mao G., Ding D., Lee J. S. H., Swim J. K., 2019. On knowledge generation and use for sustainability. Nature Sustainability. The HRB is China's second largest inland river basin located in the arid and semi-arid Northwest and is an important source of the terminal Juyan Lake, a water body critical for supporting the oasis in surrounding areas. The lake became dry in 1992. Degradation of the lake not only led to a decrease in oasis area, but it also made the lake bank a potential source of dust for regions thousands kilometers away e.g. the Beijing City. Early investigation of the HRB problems followed the 'tree model'. Prior to the 1990s, disciplinary research dominated the study of the hydrological processes, agricultural water use etc. But such research did not help reverse the trend of ecological degradation. The degradation of the lake and the impacts on Oasis made researchers and policy makers realize that the knowledge produced was insufficient. Interdisciplinary investigation emerged in early 1990s. An interdisciplinary collaborative research team from different institutions was formed in 1995 to investigate the driving forces for the drying-up of the Juyan Lake and ecological degradation of oasis. One outcome of the 1995 collaboration effort was the proposal of a water allocation scheme, which the central government accepted in 2000. As a result, a water diversion intervention asking for a minimum of water release from the middle to lower stream was implemented, which played an important role in improving the ecological environment in the coming years. The shift towards an interdisciplinary, solution-oriented approach has played an important role in restoring the degraded ecosystems in the Heihe River Basin. The surface area of the Juyan Lake had been expanded. Meanwhile, the ground water level increased in downstream areas. The research and management practice in the HRB has fostered sustainability in other arid and semi-arid river basins in China, e.g. the implementation of a pilot project by the Chinese Academy of Sciences for the integrated assessment of Mountain-Water-Forest-Farmland-Lake in Qilian	Accepted, figures dropped. This case study was revised to focus on Arabian Peninsula and North Africa. Oases issues in China are incorporated in abridged for in Section 3.3. We emphasized on the need to study how climate change affects oases more.
11701	75	16			Highlight "Siwa" on map - not easy to pick out among all the towns and oases. [Paul Dirmeyer, United States of America]	Accepted, done.
6999	75				Fig 3.18: Just a comment, the map is rather busy, and it takes a while to find the "Siwa Oasis" which is only labelled "Siwa" on the map. Can you highlight it somehow? [Debra Roberts, South Africa]	Accepted, done.
32155	76	1	76	1	Is there any evidence for a role of climate warming? If so, cite. If not, add "may" or "possibly". The 3.8.3.4. Case study includes the type of information that is appropriate. [Stephen Prince, United States of America]	Accepted, information on the role of climate change highlighted.
12757	76	4	76	4	Figure 3.19 needs some graphical improvement [Tiziana Susca, United Kingdom (of Great Britain and Northern Ireland)]	Noted, this figure was removed.
11955	76	4	76	6	Figure 3.19: It is impossible to compare these two images. Please provide maps that have the same scale, resolution, layout, colourcode to make them comparable. The resolution of both images is also very poor and it is difficult to read the images or the legends. [Hans Poertner and WGII TSU, Germany]	Noted, this figure was removed.
32157	76	4	76	6	Image quality so poor that the point is hard to detect. [Stephen Prince, United States of America]	Noted, this figure was removed.
4167	76	4	76	9	The resolution for figures 3.19 and 3.20 MUST be improved. [Eugenia Gayo, Chile]	Accepted, those are dropped.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11957	76	7	76	9	It is not clear how Figure 3.20 shows an increase - it is just an accumulation of water. Please provide an explanation in the legend. Is this figure necessary? [Hans Poertner and WGII TSU, Germany]	Noted, this figure was removed.
32159	76	9	76	9	This image does not illustrate any increase. Is it that the pool was not present before? If so, add note to caption to clarify. [Stephen Prince, United States of America]	Noted, this figure was removed.
32161	76	13	76	13	They are variables, not parameters. [Stephen Prince, United States of America]	Accepted, corrected.
7001	76				Fig 3.19: the left and right maps are so different it is hard to know what one is looking at. Is it possible to use the same colour schemes in both? [Debra Roberts, South Africa]	Noted, this figure was removed.
32163	77	7	77	8	Is this illustrated in Fig 3.20? If so, cite. [Stephen Prince, United States of America]	Noted, this figure was removed.
11959	77	10	77	12	Figure 3.23 should be redrawn and enlarged, no dotted background, no lines. What data are these - monthly means? Please provide standard deviation. What was the measuring interval? What satellite image analysis was done? [Hans Poertner and WGII TSU, Germany]	Noted, this figure was removed.
4169	77	14	77	15	This statement could be enriched with references for the southern hemisphere: i.e. the Atacama Desert in South America (e.g. Santoro et al. 2017, Rojas et al 2007) and/or the Namib desert (Newsham and Thomas, 2011). [Eugenia Gayo, Chile]	Accepted, following other comments, this section was re-organized. This discussion of oases in China has been incorporated in modified way into other sections, primarily into observations sections. Where we will added these references.
4171	77	14	77	15	Rojas, R., Dassargues, A., 2007. Groundwater flow modelling of the regional aquifer of the Pampa del Tamarugal, northern Chile. Hydrogeol J 15, 537–551. [Eugenia Gayo, Chile]	Acccepted.
4173	77	14	77	15	Santoro, C.M., Capriles, J.M., Gayo, E.M., de Porras, M.E., Maldonado, A., Standen, V.G., Latorre, C., Castro, V., Angelo, D., McRostie, V., Uribe, M., Valenzuela, D., Ugalde, P.C., Marquet, P.A., 2017. Continuities and discontinuities in the socio-environmental systems of the Atacama Desert during the last 13,000 years. Journal of Anthropological Archaeology 46, 28-39. [Eugenia Gayo, Chile]	Accepted.
4175	77	14	77	15	Newsham, A.J., Thomas, D.S.G., 2011. Knowing, farming and climate change adaptation in North-Central Namibia. Global Environmental Change 21, 761-770. [Eugenia Gayo, Chile]	Accepted.
3835	78	1	78	12	This part of section 3.8.3 points out repeatedly (lines 1-2, 6-7, 11-12) the impact of population growth on overexploitation of resources and salinization of oasis systems. [Philippe Waldteufel, France]	Noted, following other comments, this section was re-organized. This discussion of oases in China has been incorporated in modified way into other sections
1459	78	3	78	13	Some pictures of the study of oasis in Xinjiang Province, China should be illustrated here. [Duanyang Xu, China]	Noted, following other comments, this section was re-organized. This discussion of oases in China has been incorporated in modified way into other sections where there is no possbility for inclusion of pictures.
1833	78	5	78	5	was -> were. [William Lahoz, Norway]	Accepted, following other comments, this section was re-organized, and the concerned phrase is no longer there.
22571	78	8	78	11	The sentence is too long and confusing. [Anastasios Kentarchos, Belgium]	Noted, following other comments, this section was re-organized, and the concerned phrase is no longer there.
25217	78	20	78	20	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Noted, following other comments, this section was re-organized, and the concerned phrase is no longer there.
25219	78	33	78	33	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, corrected.
3667	78	29			reconsider title: difficult to understand. Does it make sense? [Cordula Ott, Switzerland]	Acccepted, rephrased as Case study on Integrated Watershed Management.
4177	79	11	79	13	Figure 3.24: Instead of identifying each panel according to its location (left, center, right), it´s preferable to give a specific letter for each of these (i.e. A, B, C). [Eugenia Gayo, Chile]	Noted, this panel is no longer part of this case study. The case study was re-organized following other comments, part of the text discussing Ethiopia is integrated selectively in Section 3.7.1.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11961	79	11	79	14	This figure needs to be able to stand alone. Please provide more information in the legend to make it independent of the text; i.e., include location (country etc.), time (year in which each photo was taken) [Hans Poertner and WGII TSU, Germany]	Noted, this panel is no longer part of this case study. The case study was re-organized following other comments, part of the text discussing Ethiopia is integrated selectively in Section 3.7.1.
24953	79	24			See comments Page 64 line 18 about ploughing and soil crusting. They are very complex issues specifically in arid environments. Therefore there is no general case: land management should be adapted to each ecosystem and each type of landuse according to local economic issues. What can be promoted in one place cannot be sustainable in an other. In semi-arid conditions, surface crusts are generalized even in non-degraded and protected environments. If crusts are responsible of the limitation i) of germinal potential of grasses and ii) of infiltration and increasing runoff, they are a protecting the soil surface form aeolian erosion (page 31, line 11). The effects of crusting can be a benefit because it's the base of water harvesting – natural water- harvesting at the base of natural banded vegetation (Valentin & d'Herbes, 1999), or artificial water harvesting, common practice in semi arid conditions in South Africa (See p 49, line 3 comments; Hensley et al., 2000; Van Rensburg, 2010). For annual crop this technique is much easier in tropical dry environments with a marked rainy season in summer, while in mediterranean dry areas, the monthly rainfall is too irregular and often occurring in the cool season to promote such practice. This practice need also a slope and is not possible in flat areas. [Pascal Podwojewski, France]	Accepted, we qualified this statment to be applicable to Jordan's Badia area, allowing space for these other cases. Water harvesting is disucssed in the next paragraph.
24955	79	24			Valentin, C., & d'Herbès, J. M. (1999). Niger tiger bush as a natural water harvesting system. Catena, 37(1-2), 231-256. [Pascal Podwojewski, France]	Noted, we provided references specific to Jordan case study.
24957	79	33			: see comments Page 50 line 8. [Pascal Podwojewski, France]	Agreed, here the focus is on sloping areas.
4179	80	4	80	7	Figure 3.25: Please, apply the same correction suggested for Figure 3.24 [Eugenia Gayo, Chile]	Accepted, done.
11963	80	5	80	7	Source of the photographs? Suggest adding a marker that indicates the size / depth of these catchments, at least approximately. [Hans Poertner and WGII TSU, Germany]	Partially accepted. Source indicated. Showing the depth is not possible with these photos in any easily comparable way, because rhey were taken from different angles, heights.
11965	80	9	80	11	Please explain any acronyms used in the legend. Provide a source for the figure. Please make it clear which data belong to which Y-axis. Check spelling errors. on the x-axis, please write "months" instead of time. Provide the year of the dataset, or the years and explain whether this is a mean over xxx years. The top x-axis has no label - is this also time? What is the interval of measurements of the PCP-bars compared to the other datasets? [Hans Poertner and WGII TSU, Germany]	Accepted, done.
32167	80	10	80	11	What is PCP? "Sstress level" should, presumably, be "Stress level" [Stephen Prince, United States of America]	Accepted, corrected.
6997	80				Fig 3.26 Please define PCP [Debra Roberts, South Africa]	Accepted, done.
4181	81	8	81	9	Figure 3.27: Please, apply the same correction suggested for Figures 3.24 and 3.25 [Eugenia Gayo, Chile]	Accepted, done
32169	81	10	81	11	An image of some check dams and the sophisticated contour water capture systems from ancient times would make the point that ILK should be heeded. The near-east (e.g. Negev) are famous for these. http://www.hdweb.design/ancient-makkah.html http://www.topoi.org/wp-content/uploads/2013/06/174-693-1-SM.pdf [Stephen Prince, United States of America]	Accepted, discussion included.
5789	81	17	81	18	Can we say, drough is slow and gradual! Why, any indicator! [Sanaz Moghim, Iran]	Comment cannot be understood.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11969	81	17	81	20	How is "drought" defined in this Report? Please check, please also cross-check with the SRCCL Glossary, and add this definition here or replace the existing text with it. [Hans Poertner and WGII TSU, Germany]	Accepted, done.
22573	81	27	81	30	This sentence is too long and confusing. This could be helped by concise shorter sentences. [Anastasios Kentarchos, Belgium]	Accepted, the sentence is split into two.
22575	81	31	81	31	" currently dry regions"- this phrase is vague. Qualify the phrase by - for example - mentioning some geographical regions. [Anastasios Kentarchos, Belgium]	Accepted, revised as "in drylands". Drylands is explained in the introduction, it is a well known geographic category.
7071	81	32	82	3	Is there a difference in these projections under difference emission scenarios? [Debra Roberts, South Africa]	Noted, this section was dropped.
6813	81	13	84	4	Cross-Chapter Box 4: Case Study on Policy Responses to Drought, where the relationship between drought and desertification, drought and land degradation is not clearly explained, and the case study is not representative at global and regional scale. Drought as a natural disaster occurs on a global scale. It is recommended to give a conclusion based on the assessment of global drought and the impact of drought on socio-economic and natural systems. [Changke Wang, China]	Noted. A sentence added on links between drought and land degradation. We gace exaamples from a wide range of regions and also globally. This box fouses on policy responses to drought, assessment of droughts occurrence is given in Chapter 2. Socio-economic impacts discussed in this Box.
7075	81	13	84	4	The treatment of the policy response seems to suggest that there are three discrete response options. Are there no instances where the three options are applied simultaneously? Also, the recent drought in Cape Town and government/citizen responses will be a good option to include in this cross-chapter box [Debra Roberts, South Africa]	Accepted, related information included.
32171	81	13	84	4	Neither desertification nor dryland degradation is addressed in this Cross-Chapter Box. So why is it in Chapter 3? Maybe it would fit in a different Chapter, but is quite irrelevant here. [Stephen Prince, United States of America]	Noted. Indeed, since it is a cross-chapter box, it does not focus on issues related to this chapter alone, and it could be placed in any other chapter as well. Although droughts occur anywhere in the world, historical experience shows their impacts are biggest in dryland areas. Droughts amplify the effects of unsustainable land management practices, especially in drylands. This topic is relevant and important for desertification.
11967	81	13			This box is very informative and interesting. Please make use of IPCC calibrated language to highlight the key messages that should be delivered [Hans Poertner and WGII TSU, Germany]	Acccepted, included.
11971	81	19			Please specify which IPCC Report - WGII? Please also indicate the chapter and, if possible, the section. When citing Chapters from IPCC reports, the reference has to be provided according to referencing convention (first author's last name, year of publication). Please replace "IPCC (2014)" with the correct source throughout this box [Hans Poertner and WGII TSU, Germany]	Accepted, done.
22577	82	4	82	5	This sentence does not give the time period when this large amount of cost was incurred. [Anastasios Kentarchos, Belgium]	Accepted, updated figures with time periods given.
7073	82	4	82	10	Some of the references in this paragraph are quite old. Ideally, an updated reference particularly for the global costs should be provided. [Debra Roberts, South Africa]	Accepted, updated references with more recent information given.
4183	82	4	82	14	South American examples could be also useful to illustrate societal impacts of protracted droughts. For instance, the 10-yr mega-drought recorded in arid and semi-arid Chile is a good case. In this sense, I suggest including it (see Aldunce et al. 2017). [Eugenia Gayo, Chile]	Accepted, included.
4185	82	4	82	14	Aldunce, P.; Araya, D.; Sapiain, R.; Ramos, I.; Lillo, G.; Urquiza, A.; Garreaud, R. Local Perception of Drought Impacts in a Changing Climate: The Mega-Drought in Central Chile. Sustainability 2017, 9, 2053. Available for download at: www.mdpi.com/2071-1050/9/11/2053/pdf [Eugenia Gayo, Chile]	Noted.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
14687	82	17	82	22	Authors should include the broader human health risks from drought (e.g., respiratory diseases, mental health, vector-borne diseases etc). To be truly cross-sectoral, suggest including adaptations to the health impacts of drought. For a summary, see: Yusa, A., Berry, P., Cheng, J. J., Ogden, N., Bonsal, B., Stewart, R., Waldick R. (2015). Climate change, drought and human health in Canada. Int J Environ Res Public Health, 12(7), 8359-412. DOI: 10.3390/ijerph120708359. http://www.ncbi.nlm.nih.gov/pubmed/26193300 [, Canada]	Accepted, relevant discussion included.
39203	83	12	83	12	FEWSNET is all capitalized. [, United States of America]	Accepted, done.
39205	83	12	83	15	This implies that FEWSNet is only East Africa but in actuality it covers all of Africa. [, United States of America]	Accepted, revised accordingly.
39207	83	37	83	39	Consider adding 'effective climate services' to this list (a key part of effective agricultural advisory services). [, United States of America]	Accepted, added.
1835	83	39	83	39	If using UK English spelling, it should be “programmes”. Similarly, in L. 42, and other chapters (like Chapter 4). [William Lahoz, Norway]	Accepted. Program is changed to programme throughout the chapter.
25409	83	39	83	43	The supply side is developped but not the demand side : what about changes of crops for more resilient crops to droughts ? [, France]	Accepted, included.
11977	83	44	84	4	This paragraph would be a good place to provide statements that summarise the assessment using IPCC calibrated language [Hans Poertner and WGII TSU, Germany]	Accepted, summary assessment using IPCC calibrated language included.
11973	83	20			Please provide exmaples, what are "perverse outcomes"? [Hans Poertner and WGII TSU, Germany]	Acccepted. That sentence was modified and moved to the paragraph discussing on drought relief measures as it fits there better. The sentence it was joined to already explains what we mean by perverse outcomes.
11975	83	23			What is ex post drought relief? Do you mean "former drought relief"? [Hans Poertner and WGII TSU, Germany]	Accepted. Clarified. We mean drought relief provided after the occurrence of droughts.
22579	84	1	84	4	The last paragraph should have clearly put in stark contrast the three methods of combatting droughts i.e. ex-ante, ex-post and drought relief. The mentioning of the methods in the paragraph is rather feeble. [Anastasios Kentarchos, Belgium]	Accepted. The key message of the case study that ex ante drought risk mitigation is much less costly than ex post drought relief measures was explicitly stated and emphasized by including a statment on the level of confidence we attach to this statement.
39209	84	4	84	4	This call out box is EXCELLENT. [, United States of America]	Noted. Thank you.
11979	84	6	84	31	This section is vague; could locations be provided, or (if the knowledge gaps are universal to desert zones) could it be made clearer? [Hans Poertner and WGII TSU, Germany]	Noted, here we are discussing on global level knowledge gaps. Specific regional knowledge gaps would be too numeorous to be elaborated. We clarfied this.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
25071	84	6	84	31	This section is quite short, and can be strengthened by mentioning a few issues. One issue that could be mentioned is the knowledge generation approach. Interdisciplinary "web" approach should be further preferred to disciplinary, linear approach, as my comment above. Our Nature Sustainability paper also emphasizes the co-design of a program (e.g. desertification control program) by working with scientists from different disciplines, governmental officials at different levels, as well as the local stakeholders. The knowledge gained from such an interdisciplinary and trans-disciplinary approaches could be more valuable to find solutions for desertification control. Another issue that could be mentioned is international collaborations, in particular the South-South Collaboration. Liu et al. (2017) demonstrates cooperation between China, Brazil and other developing countries to exchange experiences in ecological restoration. The collaboration brought Brazilian experts to the Loess Plateau in China to learn the desertification control and ecological restoration, and Chinese experts to Brazil to learn biodiversity conservation. Experience and expertise sharing, co-financing, and co-development of know knowledge and know-how are important to desertification control, and bilateral and multilateral cooperation among and within countries is of importance for large-scale ecological restoration. Liu J., Calmon M., Clewell A., Liu J., Denjean B., Engel V.L., Aronson J., 2017. South-south cooperation for large-scale ecological restoration. Restoration Ecology 25 (1): 27-32. Liu J., Bawa K. S., Seager T., Mao G., Ding D., Lee J. S. H., Swim J. K., 2019. On knowledge generation and use for sustainability. Nature Sustainability. [Junguo Liu, China]	Noted.
32173	84	6	84	31	While important points are made here, it is very brief. Since the topic is far more relevant that large parts of this Chapter, it would be very worthwhile strengthening it. The IPBES LDRA has a large section on this topic which, while not all relevant to desertification, much of it is. [Stephen Prince, United States of America]	Noted.
24837	84	7	84	31	The conclusion on page 84 line 7 is incongruous with the executive summary of the chapter on page 5 line 16. If there is lack of knowledge due to methodological shortcomings, how do you get medium evidence that climate-human interaction influences desertification? [Justice Issah Musah Surugu, Germany]	Rejected, the knowledge gap is in the exact extent of areas under desertification, not on the influence of human and climatic drivers on desertification.
8973	84	9	84	11	"on specific desertification processes, such as soil erosion, salinisation, nutrient depletion, and vegetation cover and composition change" These processes are not specific for desertification [Jean-Luc Chotte, France]	Accepted, corrected as such desertification processes as
8975	84	13	84	13	"Considering the non-equilibrium nature of drylands" - Again this is confusing. See above, line 24 [Jean-Luc Chotte, France]	Accepted, dropped.
21099	84	17	84	18	This is a key point and should be made clear in the executive summary and SPM [, United Kingdom (of Great Britain and Northern Ireland)]	Accepted, current Executive Summary has this statment.
39211	84	17	84	18	Expand. Monitor what? [, United States of America]	Accepted, included.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
4187	84	19	84	25	This section should also treat the fact that scientific-based evidences for the direction and magnitude of the desertification process at regional scales is not geographically well-distributed. Indeed, some arid socio-ecological systems have been extensively studied in this regard, whereas others the research/knowledge about that is incipient or inexistent. [Eugenia Gayo, Chile]	Accepted.
5791	84	23	84	23	good to have examples for "anthropogenic drivers of desertification" with references [Sanaz Moghim, Iran]	Noted, please see Section 3.2.4.2 for detailed discussion and examples.
25191	84	29	84	29	SDGs, if abbreviation is introduced on page 14, line 31 [Alexander Erlewein, Germany]	Accepted, done.
3669	84	31			This chapter mainly asks for more research. Yet, it is clear (and mentioned in several places throughout this report) That action is needed. This demands collaborative processes between science and civil society actors on all level. In this responses are created (see for example: WOCAT/SLM) [Cordula Ott, Switzerland]	Noted.The purpose of this section is to highlight on knowledge gaps.
5799	85	1	85	31	don't you want to add the role of "government and policy makers and public awareness here! [Sanaz Moghim, Iran]	Rejected, thank you for this valuable suggestion. These aspects are discusses in depth in Sections 3.7.2 and 3.7.3, FAQs are meant to have a specific focus, adding these aspects will broaden them and to loose focus.
27045	85	1	85	33	This first question of FAQ3.1 addressing climate change and desertification and land is unclear about cause and effect, please revise, and describe the interactions of climate change and desertification. The second question of FAQ3.1 on response options to desertification should please be treated in a separate FAQ. The theme of FAQ 3.2. is not clear. The answer is not specific to deserts and does not seem to respond to the question raised but rather refer to the role of SLM in mitigating climate change and preserving ES and biodiversity. We strongly welcome a stand-alone FAQ on SLM in this chapter or elsewhere as SLM is key to this report and it would be helpful to inform the audience about this approach. We suggest using text of the last para of FAQ3.1 and of FAQ3.2 as a starting point. [, Germany]	Noted, FAQs clarified. FAQ 3.1. separated into two. This chapter is focused on desertification, rather than deserts. SLM is treated extensively across the report, this FAQ provides a non-technical explanation to broader audiences.
32175	85	1	85	33	Surely IPCC does not think these are the only "Frequently asked questions" worth noting? And the second is not relevant to this Chapter. Table 4.14 in the IPBES LDRA is the sort of range of issues that deserve the term "Frequently asked". Although only a few of those in IPBES Table 4.14 are relevant to desertification, it does suggest an appropriate framework. I would think the most frequently asked questions include: What is desertification? What aspects of ecosystems are most affected? Where does it occur? How severe is it? Can it be prevented/controlled/remediated? What are the effects of the several components of climate change (climate, extreme events, human activities, atmospheric CO2 increase, N deposition....)? What is the use of global studies when desertification is often caused by local degradation? [Stephen Prince, United States of America]	Noted. This set of frequently asked questions across the report is an outcome of discussions, suggestions and selection by a big number of authors in this report. Some issues that you are raising are covered by other FAQs, e.g. FAQ 1.3.
11981	85	3	85	16	FAQ 3.1: A definition that lay audiences might find helpful is missing here and could be integrated from FAQ 1.3. While FAQ 1.3. does not seem to be much more than a definition, FAQ 3.1 presents far more information that readers might care about. [Hans Poertner and WGII TSU, Germany]	Accepted. Definition included. Shortened and simplified.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
24959	85	3	85	31	There are some cultivated areas with annual/perennial crops in drylands. In these areas, soil cover by mulching is limiting soil evapotranspiration and therefore maintain soil moisture and soil carbon content at higher levels. However there is not much organic matter available as compost or harvest residues in drylands according that the production of biomass is reduced especially in non irrigated areas and harvest residues are very often used as complementary fodder for animals. Therefore it would be a solution to imagine a trade of organic matter as composted organic matter from cities – where people are migrating especially in arid areas – collecting, transforming and transporting to rural areas - for cultivated surfaces in drylands. Even it is almost impossible o sequestrate carbon ins sandy soils, which are often dominant in dry areas, inputs of organic matter would i) maintain/increase soil fertility ii) limit the water evapotranspiration and iii) as consequence potentially increase the above ground biomass to sequestrate carbon. Other gap is the lack of long term agronomic trials in arid lands with rainfed plantation to test genetic varities, crop rotation, organic inputs vs water cycle and land-use practices for cultivated and rangelands. Because of the slow growing rate of plants, and slow evolution of carbon content, soil microbial status, and the slow resilience of these environments these trials are necessary. However such observatories in arid and poor countries are expensive to sustain for long time period. In very aridic areas, promoting better techniques for irrigation should be strictly limited in areas where surface water is available by water harvesting or dams. Fossil water should be restricted to drinking water in hyperarid areas. [Pascal Podwojewski, France]	Noted. Added discussion on on the use of biogass slurry as soil amendment. Many technologies mentioned are discussed in 3.7.1. This comment is broad and rich in elements, we touched on related issues across the chapter and the report.
18311	85	3	85	32	After reading the entire magnificently written section, the main question arises -–– can humankind cope with and be able to manage such a phenomenon as desertification of drylands at a global scale? Or it is doomed to constant activity in the "fight" with this phenomenon. Given the many factors determining desertification, as well as the fact that dryland ecosystems are principally unstable in their nature, their behavior is poorly predictable and almost not manageable. Or can this be achieved in a smaller area, only at the regional or local level? [Anatoliy Mandych, Russian Federation]	Noted, human activities are drivers of desertification, in interactions with climatic factors. We can change human actions towards more sustainable land management, hence it is possible sustainbly manage drylands... it is a complex process involving many factors, but we know that it would only be successful if the recovery and rehabilitation tasks of the desertified dry zones are applied in combination of policies and technologies as well as with close collaboration with local communities, perhaps that is why it is much better observed in local case studies.
18313	85	3	85	32	It seems that for the time being we can only strive to adapt to desertification as thoroughly as possible. Fundamentally change this super-complex process, humanity is not able to. Therefore, it is probably more correct to talk about adaptation to desertification, and not about combating it. The whole past human experience testifies to this. [Anatoliy Mandych, Russian Federation]	Rejected. Human activities are drivers of desertification, in interactions with climatic factors. We can change human actions towards more sustainable land management, hence combating is appropriate.
5793	85	8	85	8	"Desertification affects global climate change through the loss of fertile soil and vegetation" good to add change of hydrometeorology. [Sanaz Moghim, Iran]	Reejected. FAQ is a non-technical explanation to broader audiences, rather than a detail and comprehensive technical definition. For this reason, we need to keep it without technical terms.
25221	85	17	85	17	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, corrected.
11983	85	17	85	20	FAQ 3.1: Suggest to integrate this information into FAQ 3.2 [Hans Poertner and WGII TSU, Germany]	Rejected. This paragraph specifically answers the second part fo the FAQ 3.1., moving it to FAQ3.2. could leave that question unanswered.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
8953	85	17	85	20	SLM is promoted as important approach to combat desertification under climate change. What about sustainable forest management? It should be elaborated together with SLM from climate change and desertification perspective. GK: I agree with Marijana. Somewhere in the Glossary it should be reflected that Forest is a Land also, so the SFM should be considered as SFM. For example: Land The terrestrial portion of the biosphere that comprises the natural resources (soil, near surface air, vegetation and other biota, and water), the ecological processes, topography, and human settlements and infrastructure that operate within that system. Forests, deserts, swamps, agricultural landscapes, urban area are typical examples of "lands". In this regard I also disagree with the term "forest" as it is defined in the Glossary through the "vegetation type" only. It should include the reference to the land as well, for example "A type of land (land cover) with the vegetation dominated by trees." The same concerns with the definitions of SLM and SFM in the Glossary: they should be intergrated or even merged. Otherwise we see that SFM is not the SLM, and this provides a big confusion. In Russia we completely disagree with this approach! [Jean-Luc Chotte, France]	Noted, suggestions on the definitions are forwarded to Chapter 4 which elaborates the definition used for sustainable land management. Here in FAQ, we list afforestation and reforestation as part of sustainable land management activities.
25411	85	18	85	19	Agroecology in general could be mentionned. Diversification of agriculture, agroforestry, ecosystem based adaptation and others are quite ofter mentioned, but agroecology no, so we propose to add a box in the SPM, and in the chapter 6 and 7, and in the glossary, to clarify that agroecology encompasses all this, so it's present even when not mentioned. [, France]	Accepted, agroecology added into Glossary. Chapter 6 uses this as a framework.
11985	85	22	85	23	FAQ 3.2: Suggest to integrate the term "sustainable land management" in the question. [Hans Poertner and WGII TSU, Germany]	Accepted, done.
25223	85	24	85	24	"sustainable land management" -> SLM, abbreviation introduced on p. 6, line 27 [Alexander Erlewein, Germany]	Accepted, corrected.
5795	85	25	85	27	better to add proper to "rangeland management" [Sanaz Moghim, Iran]	Accepted, added sustainable.
5797	85	27	85	29	better to add deforestation reduction before "reforestation and afforestation practices" [Sanaz Moghim, Iran]	Accepted, included.
26197	104	17	104	20	Please correct the reference: the names of the authors is repeated twice. The correct reference is : Etongo, D., Djenontin, I.N.S., Kanninen, M., Kalame, F. 2015. Smallholders' Tree Planting Activity in the Ziro Province, Southern Burkina Faso: Impacts on Livelihood and Policy Implications Forests 6, 2655-2677. [Markku Kanninen, Finland]	Accepted, corrected.
22187	114	10	114	10	Should not it be 'modelled' rather than 'modellef'? [Edson Leite, Brazil]	Rejected, no such spelling mistake found in the given page and line, neither in the entire chapter.
13331					I have no comments. [Abdelkader Elouissi, Algeria]	Noted.
3581					Migration: migration is discussed as a North-South problem. Out-migration is discussed in the local context. But what is not discussed sufficiently is in-migration (the other side of out-migration) especially in to semi-arid areas,,, this is a major factor putting stress on local socio-ecological systems... so: where out-migration is discussed, also consider to dicuss where people are going to, and what effcets in-migration can have. [Cordula Ott, Switzerland]	Accepted, in-migration discussed now in Section 3.5.2.6 on Migration.
41571					increased in some dryland areas over the past several decades {3.3.1} " is missunderstand and isn´t reflected in this [Cristobal Felix Diaz Morejon, Cuba]	Comments 41571, 41573, 41575, 41577 are one comment. Our response: Rejected. Section 3.3.1 specifically highlights examples of those regions where desertification trends were reported. No contradiction between reviewer comment and the text in terms of interactions between climatic and anthropogenic factors.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
41573					way in section (3.3.1) - in 3.3.2 PAGE 26 LINE 15 Desertification is a result of complex interactions within coupled social- [Cristobal Felix Diaz Morejon, Cuba]	Comments 41571, 41573, 41575, 41577 are one comment. Our response: Rejected. Section 3.3.1 specifically highlights examples of those regions where desertification trends were reported. No contradiction between reviewer comment and the text in terms of interactions between climatic and anthropogenic factors.
41575					ecological systems, and Page 26 line 15 to 17 - Thus, the relative contribution of climatic, anthropogenic and other factors [Cristobal Felix Diaz Morejon, Cuba]	Comments 41571, 41573, 41575, 41577 are one comment. Our response: Rejected. Section 3.3.1 specifically highlights examples of those regions where desertification trends were reported. No contradiction between reviewer comment and the text in terms of interactions between climatic and anthropogenic factors.
41577					to desertification will vary depending on specific regional contexts. [Cristobal Felix Diaz Morejon, Cuba]	Comments 41571, 41573, 41575, 41577 are one comment. Our response: Rejected. Section 3.3.1 specifically highlights examples of those regions where desertification trends were reported. No contradiction between reviewer comment and the text in terms of interactions between climatic and anthropogenic factors.
41579					demand pressures and environmental changes [Cristobal Felix Diaz Morejon, Cuba]	Unfortunately, it was not entirely clear what was meant. We could therefore not respond to it. No page numbers given.
41581					ecosystem service performance and land improvement [Cristobal Felix Diaz Morejon, Cuba]	Unfortunately, it was not entirely clear what was meant. We could therefore not respond to it. No page numbers given.
41583					desertification when it occurs in drylands" isn´t clear and it isn´t precise. The process of desertification not only occur [Cristobal Felix Diaz Morejon, Cuba]	Comments 41583, 41585, 41587, 41589 are in fact one comment. Although no page and lines are given, we can understand they refer to our definition of desertification. Our response: Rejected. Desertification is defined to exclusively happen in drylands.
41585					by land degradation but when coincide(concur) other factors as high temperature, drought or scarce precipitations, [Cristobal Felix Diaz Morejon, Cuba]	Comments 41583, 41585, 41587, 41589 are in fact one comment. Although no page and lines are given, we can understand they refer to our definition of desertification. Our response: Rejected. Desertification is defined to exclusively happen in drylands.
41587					biodiversity losses at elevate rhythm, increases in potential evaporation, erosion, human-induced processes and other [Cristobal Felix Diaz Morejon, Cuba]	Comments 41583, 41585, 41587, 41589 are in fact one comment. Although no page and lines are given, we can understand they refer to our definition of desertification. Our response: Rejected. Desertification is defined to exclusively happen in drylands.
41589					factors; and it isn´t privative of drylands. [Cristobal Felix Diaz Morejon, Cuba]	Comments 41583, 41585, 41587, 41589 are in fact one comment. Although no page and lines are given, we can understand they refer to our definition of desertification. Our response: Rejected. Desertification is defined to exclusively happen in drylands.
41591					affirmation: " There is a significant potential for climate change to increase global soil erosion by water, as [Cristobal Felix Diaz Morejon, Cuba]	Commnets 41591, 41593, 41595 are one comment. Our response: Accepted, the sentence modified accordingly to reflect that soil erosion may increase in those regions where precipitation volumes and intensity are projected to increase, and not uniformly across the globe.
41593					precipitation volumes and intensity are projected to increase " because the projections are differents in the different [Cristobal Felix Diaz Morejon, Cuba]	Comments 41591, 41593, 41595 are one comment. Our response: Accepted, the sentence modified accordingly to reflect that soil erosion may increase in those regions where precipitation volumes and intensity are projected to increase, and not uniformly across the globe.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
41595					Regions of the World, for example will be different in the tropical and sub-tropical zones that in the template zones. [Cristobal Felix Diaz Morejon, Cuba]	Commnets 41591, 41593, 41595 are one comment. Our response: Accepted, the sentence modified accordingly to reflect that soil erosion may increase in those regions where precipitation volumes and intensity are projected to increase, and not uniformly across the globe.
41597					of Desertification [Cristobal Felix Diaz Morejon, Cuba]	Unfortunately, it was not entirely clear what was meant. We could therefore not respond to it. No page numbers given.
41599					effects on agriculture (crops, lands) including others of acarus and illness for animals and population that accomplish [Cristobal Felix Diaz Morejon, Cuba]	Unfortunately, it was not entirely clear what was meant. We could therefore not respond to it. No page numbers given.
41601					the dust. [Cristobal Felix Diaz Morejon, Cuba]	Unfortunately, it was not entirely clear what was meant. We could therefore not respond to it. No page numbers given.
41603					If it s factible I propose reinforce with new literature the aspects seen in point 3.5.1 [Cristobal Felix Diaz Morejon, Cuba]	Unfortunately, it was not entirely clear what was meant. We could therefore not respond to it. No page numbers given.
41605					exacerbation and viceversa over the small islands is poor treated. The attention to this aspect is vital for SIDS. [Cristobal Felix Diaz Morejon, Cuba]	Unfortunately, it was not entirely clear what was meant. We could therefore not respond to it. No page numbers given.
41607					more advanced literature. [Cristobal Felix Diaz Morejon, Cuba]	Unfortunately, it was not entirely clear what was meant. We could therefore not respond to it. No page numbers given.
41609					arid". Please, this affirmation is very strong and have be very well documented writting the necessary references. [Cristobal Felix Diaz Morejon, Cuba]	Unfortunately, it was not entirely clear what was meant. We could therefore not respond to it. No page numbers given.
39213					There's a general lack of consideration for groundwater supplies and water table dynamics in this chapter. Authors should provide some insight on this important characteristic for arid and semi-arid systems. [, United States of America]	Accepted: we add the following paragraph (page 35 L12): Globally, the groundwater has been reduced since 1900 and with its maximum rate has been recently (2000-2008), averaging 145 km3 yr-1 (Konikow, 2011). The arid lands are very vulnerable to groundwater reductions, because the current natural recharge rates are lower than the previous wetter periods (e.g., Atacama Desert and Nubian aquifer system in Africa; Squeo et al., 2006; Mahmod and Watanabe, 2014; Herrera et al., 2018). The main drivers of groundwater depletion in arid lands are their extraction by pumping (medium evidence, high agreement; Mudd, 2000; Jolly et al., 2008; Mays 2013; Mahmod and Watanabe, 2014), climate variability (medium evidence, high agreement; Wang et al. 2002; Wurster et al., 2003; Scalon et al., 2006; Squeo et al., 2006; Woodhouse et al. 2010), and land use change (medium evidence, low agreement; Scalon et al. 2006; Jolly et al., 2008).
39215					Throughout entire chapter technical words need to be removed if possible or defined if not. [, United States of America]	Accepted, we have tried to do this to the extent possible. We alsopointed to Glossary for the definitions of technical words which would not be possible to replace. e.g. soil salinity, etc.
39217					In many parts of the chapter there is only discussion of the 'extent' of degradation, and no mention of 'depth' - to use terms from epidimiology. Which areas are most deeply affected? The fixation on area affected seems a little misleading and incomplete. [, United States of America]	Noted. Information on severity is added when available, in sections 3.3.1.2 and 3.6.
39219					All the maps need to be improved by constraining to ~60S-70N, and projecting. [, United States of America]	Noted, we improved the resolution of maps, also constrained to above 60S. However, constraining to below 70N crops off parts of several countries, and is also inconsitent how maps are produced in other chapters.
39221					The term UNCCD needs to be defined at first usage (Line 4, Page 8). [, United States of America]	Accepted, done.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
39223					This chapter has lots of great analyses, and the authors should be commended for their efforts. But there is very little attention to the differing impacts of varying levels of global warming. Shouldn't we be very concerned about conditions in arid lands if warm to 3°C or more? Seems like this should be covered better in this chapter. [, United States of America]	Accepted. New quantitative and comparative analyses are presented to demonstaret that desertification impacts at different warming levels. We note that such literature is currently very limited.
39225					The chapter mentions the important role played by population pressure and overgrazing, but provides little analysis regarding these problems. Where are such problems creating the greatest amount of arid lands degradation? [, United States of America]	Both population pressure and overgrazing are among the many drivers of dryland degradation, we have discussed on socio-economic and policy measures for these and other drivers of desertification in Section 3.7.
39227					The chapter mentions the important role played by population pressure but does not have much discussion of responses to this issue. This should be discussed more completely. [, United States of America]	Noted, population pressure is one of the many drivers, and some response options such as economic diversification, empowerement of women relevant to this issue are discussed in the responses section.
39229					Go through all the summary bullet points at the beginning and try very hard to make the language less technical and more accessible. Every technical term should be explained or replaced with an easier to understand phrase. [, United States of America]	Accepted, done.
21755					Careful editing of the entire executive summary to give clearer messages is required [Graham von Maltitz, South Africa]	Accepted, done to our best ability.
98					Shoulod also comment on the role of women in agricultural production, particularly in sub-saharan Africa. Also the chnagiog face of agriculture with aging populations, outmigration, shortage of labour, etc. [Julian Dumanski, Canada]	Accepted, the role of women is discussed both in the impacts section 3.5.2.4. and responses section 3.7.1.3. Similarly, agricultural change and migration related issues are discussed in Sections 3.7.1.3. and 3.5.2.6. We covered these aspects to the extent possible within given page limits, with a focus to issues that are specific to desertification, climate change, SLM.
4003					Impacts of dusts on health, infrastructure, regional radiative forcings need to be further assessed. [Noureddine Yassaa, Algeria]	Accepted, discussion is expanded., unfortunately we are limited in our page numbers.
4005					Make more clear the diference between land degradtion and desertification. [Noureddine Yassaa, Algeria]	Accepted, further clarified.
4009					Future projected dust storms and their porjected future rsiks on different components need to be assessed with availablle science. Their attribution to the future radiative forcing in short, mid and long terms. [Noureddine Yassaa, Algeria]	Noted. Assessment added where literature is available
4101					Adaptation options to dust storms under warming climate need to be assessed. [Noureddine Yassaa, Algeria]	Accepted, Section 3.7.1 now contains information on technological responses through sand dune stabilization.
11611					Waste disposal particularly in developing countries is not covered. The only reference to disposal is (Singh et al. 2004) and this relates to waste water. A modelling study (Dumble 2017) on municipal solid waste (MSW) disposal in the MENA region showed that increasing dry climate (tropical and temperate) desertification could increase MSW methane disposal emissions rising from 1.70% to 2.28% by 2050 in the MENA region; 1.83% to 2.47% in North Africa; 2.21% to 2.78% in West Asia and 1.61% to 1.88% in GCC Countries. However, developmental changes measured as MSW characterisational change (Hoornweg and Bhada Tata 2012) as developing (high, middle and low income) countries transform to high income developed countries could see decrease in emissions in North Africa of 8.26% falling to 9.33%; in the MENA region of 8.75% falling to 10.16%, in West Asia of 9.65% to 10.89%, with the GCC countries 6.44% falling to 7.32%, though without the intervention of significant mitigation total desertification and developmental emissions would rise due to projected increases in population and urbanisation. [Paul Dumble, United Kingdom (of Great Britain and Northern Ireland)]	Rejected. Thank you for this important indication. We agree with you that municipal solid waste management is an important topic. However, due to the following reason this aspect is beyond the scope of this chapter. This chapter focuses on desertification, i.e. land degradation in drylands, whereas in the reference you indicated desertification is understood as "hotter and drier climate conditions", thus although relevant for issues related with climate change, this reference is does not treat dryland degradation.

Comment No	From Page	From Line	To Page	To Line	Comment	Response
11613					Dumble P. (2017). Regional development and climate change mitigation modelling of municipal solid waste emissions in Middle East, Water and Environment Journal, John Wiley, Vol3, No.2, p226-234, May 2017, DOI: 10.1111/wej.12236; Hoornweg, Daniel, and Perinez Bhada-Tata. 2012. What a Waste: A Global Review of Solid Waste Management. Washington, DC: © World Bank, 98pp. Accessed on 23/7/2017 at: https://openknowledge.worldbank.org/handle/10986/17388 [Paul Dumble, United Kingdom (of Great Britain and Northern Ireland)]	Rejected. Thank you for this important indication. We agree with you that municipal solid waste management is an important topic. However, due to the following reason this aspect is beyond the scope of this chapter. This chapter focuses on desertification, i.e. land degradation in drylands, whereas in Dumble (2017) desertification is understood as "hotter and drier climate conditions", thus although relevant for issues related with climate change, this reference is does not treat dryland degradation. Hoornweg et al (2012) make link between waste and climate change, but without reference to desertification.