

External review of the second order draft of the land degradation and restoration assessment

1 May - 26 June 2017

Chapter 3

Reviewer Name	Chapter / SPM	From Page (start)	From Line (start)	To Page (end)	To Line (end)	Comment	Response (from Chapter 3)
LI Qingfeng	All Chapters					Overall comments for the Book: 1,there seems too many repetitions in different chapters and sections for the subject matters of definations, descriptions and explaications, etc., of "land degradation and restoration". Although they are necessary for each individual Chapters, it seems a little bit redundance if appearing in the same book. 2, The economical (cost-benefit) analyses, as well as the ecological assessments, behind the "Succesfull stories", should be strenthened, if the stories are more convincing, in paticularly, if the success is backed with big "projects".	Agree, redundant text on LDR definition and approach has been taken out in discussion with other CLAs. The final report has been streamlined as much as possible.
Germany	All Chapters					We urgently request the chapter authors to ensure that all facts and figures contained in the chapters are accurately cited and adequately referenced with up-to-date sources. We also encourage chapter authors to cross-check, whether the same facts and figures on a specific theme are being used throughout the assessment.	Agree, consistency between chapters has been checked in the final report.
Germany	All Chapters					Please ensure that in all chapters information and case-studies are provided from all regions.	We made a particular effort to include examples and case studies from all word regions in the final report, supported by the expertise within the group of authors, and a thorough review of the available litterature.
Germany	All Chapters					We kindly request the co-chairs and chapter authors to ensure that the key findings emerging from each chapter are captured in the key messages of the SPM .	The SPM has been revised based on the updated key findings from the chapters.
Germany	All Chapters					Please include the concept on 'planetary boundaries' in your discussions.	The concept of planetary boundaries is discussed in several chapters of the assessment.
Germany	All Chapters					Ensure that terminologies are used consistently throughout all chapters.	This has been addressed.
Germany	All Chapters					It is appreciated that each chapter starts with an "executive summary" Please ensure that all Figures/Tables have a high resolution quality. A glossary should be included that provides definitions/explanations of the frequently used terms. Each chapter should also start with a list of acronyms/abbreviations used in the chapter. In some Figures and Tables colours have been used to outline status and trends in a regions or a country. It would be very helpful if the same colour is used for a country/region throughout a chapter and preferably throughout all 8 chapters. The term 'NCP' should be used consistently and with the exact wording provided in IPBES-5/1.	All of these elements have been ensured for the final draft of the report, for all chapters.
Germany	All Chapters					Ensure that definitions, facts, figures and trends outlined in the 8 chapters e.g. on the spatial extent of land degradation / the spatial extent of wetland / water / soil / urbanisation / deforestation / wild fires / conflict, etc... are consistent across all chapters.	The consistency between the different chapters has been reviewed by the chairs and the TSU.
Germany	All Chapters					It is also not clear whether there is consistency between the chapters, what role agricultural lands have in the land degradation theme? Are they considered per se to be degraded sites or are they transformed lands, whose productivity can be negatively affected through severe exploitation? Clarification required.	The discussion on the role of agricultural lands in regards with degradation was addressed within the discussion on baseline, in chapter 1.
Germany	All Chapters					We strongly encourage the authors to check, whether information on certain issues has already been provided in one of the previous chapters of the assessment report. If this is the case, then it would be useful to avoid redundancies and rather consider cross-referencing between chapters . Sometimes the impression arose that there was no exchange between the authors of the different chapters.	The cross-referencing between chapters has been addressed at the 3rd authors' meeting in July 2017.
Germany	All Chapters					We strongly encourage the chapter authors to ensure that their key findings are reflected in the key messages of the summary for policymakers .	The consistency between the key messages of Chapter 3 and the content of the SPM referring to Chapter 3 has been checked.

Germany	All Chapters				We encourage the authors to spell out the acronyms when they are introduced for the first time in the text.	This has been checked
Germany	All Chapters				All reference lists need to be rechecked regarding completeness, spelling and they also need to be structured in a similar style.	This has been done, with the support of the TSU
Thomas Brooks	All Chapters				Congratulations to all authors for their great efforts towards delivery of this SOD	Thank you!
Thomas Brooks	All Chapters				In many places, the report uses language like "biodiversity and ecosystem functions and services". I recommend deleting the "functions and" throughout. This would be consistent with a) the wording and intent of widely-accepted definitions of biodiversity (eg CBD, IPBES itself) that encompass all levels and types of genetic, species, and ecosystem diversity (see eg Noss 1990 Conserv Biol), and b) the IPBES conceptual framework, which i) includes composition, structure, and function of genetic, species, and ecosystem diversity in its "Nature/Mother Earth" component while ii) including ecosystem services/nature's gifts in its "Nature's Contributions to People" component.	We agree with the comment and the definition of biodiversity. However, we worked with the terminology provided in the LDR scoping document which included: "Degraded land is defined as land in a state that results from persistent decline or loss of biodiversity, ecosystem functions and services...."
Astrid Hilgers	All Chapters				On the definition of landdegradation: Agreement on baselines is a essential to set verifiable targets and track progress towards these targets. A natural state baseline, although it has some problems to solve, offers a fair and unambiguous reference to compare current and future state and trends. However, land degradation is a multidimensional issue, concerning the change in and trade offs between soil variables, vegetation, biodiversity components, water characteristics and many ecosystem functions and services. Consequently assessing any deviation from the natural state baseline of one or more of these factors as ' degradation' would result in the entire world being degraded. In this approach land degradation would lost its political utility. An alternative approach would be to map and quantify these changes compared to the natural state baseline without judging as ' degradation', and consider these changes as trade-offs, often unintentionally, from a particular use of the land such as forestry, cropland or housing. Whether these changes and trade offs are accepted or not and can be considered as degradation belongs to the political domain, not the scientific. This approach creates a strict distinction between measuring and assessing factual changes and the judgment whether it is acceptable or not, clarifying the different roles of science and politics, and taking away the barriers to fulfill their tasks properly.	Thank you for your detailed comment on this. This is now addressed under the definition of the baseline.
Astrid Hilgers	All Chapters				The assesment, in specific the SPM and chapters 2 and 3, seem to be biased towards conservation agriculture as a solution, while a wider range of sustainable landmanagement practices and other response options should be considerd. Chapter 6 provides this wider range of options.	We now give a more balanced vision of different agricultural practices at chapter 3 level.
Astrid Hilgers	All Chapters				More attention should be payed to the role that the private sector could pay, in the SPM and trougout the document. References p.e.1. Levashova 2011 Opportunities and challenges for private sector entrepreneurship and investment in biodiversity, ecosystem services and nature conservation, Opportunities and challenges for private sector entrepreneurship and investment in biodiversity, ecosystem services and nature conservation. 2. Jenkins, Scherr and Inbar 2012 Markets for Biodiversity Services: Potential Roles and Challenges Journal Environment: Science and Policy for Sustainable Development 3. business for sustainabl;e landscapes, an action agenda, Scherr at all 2017, published by ecoagriculture partners and IUCN. 4. Scaling Up Investment & Finance for Integrated Landscape Management: Challenges & Innovations, Shames at all 2013, published by ecoagricultes partners 5. Finance for One Planet, leenders and Bor 2016 www.rvo.nl/CoP_FINC 6. scaling up investments in ecosystem restoration, policy brief netherlands assesment agency , sewell, Bouman, van der esch 2016 http://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2016-scaling-up-investments-in-ecosystem-restoration_2088.pdf 7.Outcome Statement – Global Landscapes Forum: The Investment Case 2016 http://www.landscapes.org/wp-content/uploads/2016/06/GLF-London-Outcomes-v02.pdf	Thank you for these references. These have been found particularly pertinent at Ch2 level and have been added in sections 2.2.2.3 and 2.2.3.2.
Astrid Hilgers	All Chapters				the term NCP should be explained in the spm and in teh beginning of the document	NCP has been defined in the Glossary and explained in the Preface of the whole report.

					<p>baseline is well addressed in the LDR Assessment. However, there is obvious overlap and redundancy as well as some conflicting information between different parts of the assessment on the issue. In the SPM the key message B1 is related to the issue of baselines and it is well elaborated in the second part of the SPM with some text, a figure and a box. The issues covered are clearly referenced to the Chapter 2 where many of the statements are further elaborated and the issue is also well covered in the Executive Summary of Chapter 2. This is appropriate as according to the Scoping Document for the LDR Assessment the chapter 2 is requested to deal with concepts.</p> <p>The overlap and some conflicting messages can be found from chapters 1 and 4. While the nature of Chapter 1 is clearly introductory and as such treating the issue of baselines could be well justified, the messages it conveys relative to the SPM and Chapter 2 are conflicting. In the Executive Summary of chapter 1 the last point reads: "Degradation and restoration are both concepts which require a baseline to be measured (unresolved). (Box 1.1). The types of baselines which can be used are briefly discussed here, and elaborated in chapter 2." Here the confidence term "unresolved" is contradictory to the very clear statement in the B1 of the SPM: "[Land degradation] is scientifically measurable (well established). Land degradation can only be measured in comparison to a baseline,...". It seems the confidence statement in the Ch 1 Executive Summary may be incorrect. It is hardly unresolved that a baseline is needed to measure amount of degradation or restoration.</p> <p>Somewhat similar statement is found in the Executive Summary of Chapter 4: "Land degradation takes place in both natural vegetation and on previously transformed land, so choice of an appropriate baseline against which to assess change is important (unresolved)". Again, the choice of confidence term may be incorrect. The statement is that appropriate baseline is important and this is likely to be well established.</p> <p>In the scoping document Chapter 4 is requested to deal with status and trends of degradation and restoration. Because status and trends need to be rooted on some baseline to be meaningful (as was discussed just above) the treatment of baselines might be justified also in chapter 4. However, it is clear that the baseline aspects covered in chapter 4 are already covered in the SPM key message B1 and referenced to chapter 2 rather than chapter 4. Much of the text in chapter 4 is similar (i.e. partly same) to the text in the SPM as well as in the Chapter 2 and thus it seems that replicating the text in Chapter 4 is redundant. To avoid confusion and repetition the section 4.1.2.3 and the related key message in the Executive Summary of Chapter 4 should be deleted and replaced with a simple reference to the SPM and/or to Chapter 2.</p> <p>Finally, in Chapter 1 there is also a box on establishing baselines (Box 1.1). While again some of the text seems to be the same as what is used in SPM and Ch2 there are also clearly deviating elements not used in other parts of the Assessment. After reading the SPM and relevant sections of Chapter 2, the box in Chapter 1 appears largely</p>	
Finnish Government	All Chapters					Thank you for your detailed comment on this. We had a lengthy discussion about the issue, and the baseline discussion has been clarified in the SPM of the whole LDRA and in the Box of Chapter 1
Finnish Government	All Chapters				C6. The word instrumental responses used in SPM, Ch 6 and 8 is kind of confusing. Legal responses are considered to be "enabling responses" not in the category of "instrumental responses". This distinction is problematic as legal instruments are also instrumental responses. I would rather say that well functioning legal and governance systems are enabling responses, while specific legal instruments such as environmental impact assessments, legal standards etc are instrumental responses.	These comments are relevant to CH6 and Ch8, not directly to Ch3. These comments have been taken into account by Ch6 and 8 respectively.
Caroline van Leenders	All Chapters				I've been working in the financial sector since 2014. I've run a Community of Practice of 15 financial institutions on natural capital in The Netherlands and wrote the eBook Finance For One Planet with Iersso9ns and 12 stories from their practice. I'm now involved in helping DG Environment of the EC with moderating a Community of Practice of financials on biodiversity. See http://ec.europa.eu/environment/biodiversity/business/assets/pdf/mission-statement_en.pdf and I'm working on the start of a CoP FIs and sustainable Landscapes in Africa. I see more and more FIs interspersed in biodiversity and investing with a landscape approach. I think it is high time to make financial flows more visible and include private finance more. If you want any details please contact me!	Agree, role of financial sector is important. It has been addressed in the final report, especially in Chapter 6 and 8 (in accordance with the scope). In chapter 5, we also included the discussion on different valuations of ecosystem services.
Virginia Meléndez Ramírez	All Chapters				All the Chapter could start with an introduction and end with the conclusions, you could standardize the chapters + Several images in some chapters can not be seen well	Agree. The formatting has been ensured for the final draft.
Pavlos Tyrologou and María José Rubial from the Panel of Experts on Soil Protection of the European Federation of Geologists (PESP-EFG)	All Chapters				Most of the document is ecology and agricultural orientated but there is a fair amount of water (surface and ground) and mining so there is some geology discussed but not in depth. We also miss a deeper assessment on the contribution of heavy industry in land contamination and degradation and the legal and political instruments in place (or maybe missing) to prevent the land degradation and promote its protection (i.e.: environmental liability directive and/or others)	The final report has been nuanced. The drivers (including the role of heavy industry in land degradation) are addressed in Ch3 and 4 in detail.

IPBES Knowledge and Data Task Force (KD TF)/ Task Group on Indicators (TGI)	All Chapters					<p>This review provides feedback from the IPBES Knowledge and Data Task Force (KD TF) / Task Group on Indicators (TGI) on the use of IPBES core indicators in your assessment. We see potential for inclusion of additional core indicators and for the more consistent use of the standardized visuals provided. For information on core indicators potentially relevant to a given chapter, please see http://www.ipbes.net/indicators (or see the tab named, "core indicators" in this spreadsheet) and check the indicator trend graphs shared by your TSU. For the trends of IPBES core indicator, standardized visualizations should be used as much as possible to ensure the consistency between and within the assessments. The KD TF/TGI aim to follow up with specific recommendations in the near future. In the meantime, do not hesitate to reach out to them through your TSU or the KD TF TSU (ipbes.kdtsu@gmail.com).</p>	Relevant core indicators have been used at Ch3 level.
U.S. government	All Chapters					<p>The role of biodiversity and functioning ecosystems appears to only be seen through a human lens and one that is directly connected to a specific area. Loss of biodiversity and ecosystem function in one area may affect downstream or far removed ecosystems - land degradation in one area may have huge affect in other areas both for biodiversity and ecosystem function (think migratory birds). The document should have a greater focus on the role of land degradation on a wider set of ecosystem functions than currently apparent.</p>	The topic is dealt with under "Long distance impacts and their legal implications" (2.2.1.3.) We admit that the example is from a human perspective only, but this is due to the fact that Ch2 deals with human perceptions. However, we discuss the intrinsic value of Nature in subchapter 2.3.1.2.
José Romero	All Chapters					<p>General: in this report, the two concepts of "land" and "soil" seem to be interchangeable. It would be useful to define both terms in a glossary attached to this report. The definition of both terms should take into account and explain differences and nuances about "what is above ground" and "what is below ground" for land and soil.</p>	The land/soil definition has been reintegrated to Ch2, section 2.2.1.3, last subsection. No direct relevant to Ch3.
José Romero	All Chapters					<p>General: in this report, the concept of "trade-off" is used in a rather negative sense, while generally a trade-off is a situation reached for the satisfaction of divergent views and interests, which is considered to be a positive solution. We wonder if this rather negative use of trade-off in the report would be correctly translated in the other non-English languages. For example, in French, we would rather think of a happy outcome when a trade-off (e.g. a compromise, a good deal) is done in front of irreconcilable antagonisms. If the use in this report is more in a negative sense, then why not qualify trade-offs as e.g. "harmful". We hope that the English speakers authors understand our point and find a way out to address it in English as well as in the other non-English languages.</p>	We assessed our use of trade-off in the chapter with scrutiny and made sure that it is neither positively nor negatively commentated
José Romero	All Chapters					<p>General: the use of the uncertainty statements in the Key Messages should follow some logics: either only in the headings, or everywhere in the paragraphs, or not at all in this section, etc. Currently, it is not clear what the rule is and which parts of the statements are accompanied with which uncertainty statement (e.g. if it is in the heading, then the whole paragraph has the same level of uncertainty?).</p>	Agree, confidence statements should be consistent. This has been ensured for the final report.
Australia NFP	All Chapters					<p>There is a lack of clear guidelines and recommendations for policymakers, particularly in the Summary for Policy Makers which is where we would expect to see them. What is really needed is a quick and easy guide to help a range of decision makers develop and implement policies which reflect the latest scientific data which this report should include.</p> <p>o For example, page 3 of Chapter 1, the Executive Summary of the Chapter, claims that the paper, as an assessment of land degradation and restoration, will evaluate, summarize and present the latest evidence to guide decisions. From our reading of the SPM and chapters, there appears to be little guidance for policymakers and decision makers on how to use the latest evidence to develop policy options.</p>	Agree, clear policy guidance on WHAT (package of) measures would support conservation of BES and which don't (chapter 3, 4, 5 and 7) and HOW these measures could be implemented in an effective and efficient manner (instruments, governance in chapter 6 and 8) are still lacking. Chapter 7 provides a set of measures in its Key Messages. These elements have been added to the SPM
Australia NFP	All Chapters					<p>The case studies in the report are not detailed enough in their current state to be broadly applicable, with little information on their outcomes, methods, and successes.</p> <p>o Case studies are frequently repeated across the chapters. More examples including possible applications in different landscapes/areas/political environments would be useful as well as the case studies effectiveness, implementation and any lessons learned. An understanding of the criteria used to rate each case study would be very useful.</p>	Chapter 1 provides a methodology for case study selection. The case studies are no longer replicated throughout the report and are more diverse in nature.

					Lack of consistency throughout the report's chapters, including definitions used for essential concepts.	
Australia NFP	All Chapters				o The report uses a definition of land degradation different to that used by the United Nations Convention to Combat Desertification (UNCCD), the premiere international body overseeing global efforts to address land degradation, desertification and drought. For example, on Page 3 of Chapter 1, in the Executive Summary, the UNCCD definition of land is used, however the UNCCD definition of land degradation is not used in the report. References to the UNCCD would be useful, along with adopting its definitions/glossary for concepts like land degradation, land restoration, etc.	Agree, the UNCCD definition of LD should be mentioned. However, the definition of land degradation for LDRA was set out and approved by IPBES Plenary , and can not be changed.
Australia NFP	All Chapters				The use throughout the report of references which are significantly dated or not consistent throughout the chapters. This makes the assessment appear to have a lack of a clear methodologies which seek to establish the quality and clarity of the evidence base used to make claims throughout the report. o A specific example of both inconsistency in referencing and use of outdated sources occurs on pages 95 and 96 of Chapter 4, and page 38 of Chapter 3. In Chapter 4, the report uses a 2005 Global Forest Resource Assessment to make claims about the extent of forest cover in a number of countries, including Australia. Yet, in Chapter 3, the report uses a much more recent Global Forest Resource Assessment, from 2015, to look at trends in forest cover decline. If there's no way to use the most recent studies/iterations of reports to support claims in the Report, then the reason for using an older report should be made clear.	Agree, we adjusted the references used to promote consistency, or explain why other sources are used and why they differ.
Steve Prince	Ch. 3	General			This chapter is very informative (and well-written). Thanks!	Thank you
David Le Maitre	Ch.3	General			I have not done any corrections for typos and the like	Thank you for taking the time to read our chapter.
Shihai LV	Ch.3	General			This chapter describes the drivers of land degradation and restoration, where begins with an examination of the indirect drivers. However, just as illustrated, "indirect drivers operate by altering the level or rate of change of one or more direct drivers." So, I think it better to describe direct drivers first and then indirect drivers.	The chapter now presents direct drivers first then indirect drivers
Steve Prince	Ch. 3	General			My main comments are structural - as we have discussed many times. The Scoping of the Assessment says: "This chapter (3) will assess how land degradation and restoration is the result of multiple drivers, involving both direct anthropogenic and natural factors and interactions between them". And Chapter 4 "Status and trends of land degradation and restoration and associated changes in biodiversity and ecosystem functions." As you know the FOD reviewers and the 2nd authors' meeting were insistent that the biophysical as well as human drivers belonged in Chapter 3, and Ch. 4 was supposed to be restricted to status and trends. But now, while Ch. 4 has removed most of the material on processes, it seems Ch. 4 has also removed processes rather than taking them up from from Ch. 4! There is very little on processes here - so there is not much about processes anywhere in the Assessment! Maybe that is as it should be in spite of the Scoping? At the same time there are significant (good) sections on status and trends here (also commented on line 737). Possible solutions with regard to the Status and Trends material in Ch. 3, are: 1. Ignore the Scoping structure and leave Ch 3 as is, with appropriate citations to/from Ch. 4 (e.g. Ch 4, line 2703). 2. Transfer the material relevant to Ch. 4 and merge. Notwithstanding, it would be necessary for Ch. 3 to mention, but not elaborate, on status in order to indicate why a process is important. So what shall we do? Given the continuing uncertainty, I have made rather few comments on the contents of Section 3.4	Addressed in FGD. Processes are treated in Chp 4.
Mahmood Yekeh Yazdandoost	Ch.3	General			Land restoration provide productive biodiversity that underpin foundation of human health and well-being;	This is an observation, with no action required from us.
Mahmood Yekeh Yazdandoost	Ch.3	General			Impaired ecosystem results in biodiversity loss, health reduction and significant social and economic costs;	This is an observation, with no action required from us.
Mahmood Yekeh Yazdandoost	Ch.3	General			Indigenous and traditional ecological knowledge could be a prominent tool for land restoration;	This is an observation, with no action required from us.
Mahmood Yekeh Yazdandoost	Ch.3	General			Friendly approach to natural resources improve land restoration; and	This is an observation, with no action required from us.
Mahmood Yekeh Yazdandoost	Ch.3	General			Monitoring priorities and objectives;	This is an observation, with no action required from us.
Mahmood Yekeh Yazdandoost	Ch.3	General			Any statistics!	This is an observation, with no action required from us.

Mahmood Yekeh Yazdandoost	Ch.3	General				Many graphs for many statements are available, why not to be used in an appropriate places?	Space constraints restricted the number of graphs that could be included
Mahmood Yekeh Yazdandoost	Ch.3	General				Suggesting this chapter to be better organized.	We have revised the final draft and believe it presents nice readability now.
Pat Brereton	Ch.3	General				It is important to privilege the importance of farmers as prime agent regarding sustainability	The role of farmers is addressed more at the level of Ch2 and Ch6, which is where we believe it best fits.
Susan Galatowitsch	Ch.3	General				This chapter needs to include coverage of indirect drivers that affect aquatic systems and freshwater resources. Chapters 4, 5, 7 include water as a major issue--this lack of coverage of water in Chapter 3 is a significant gap.	The coverage of indirect drivers in the chapter relates to all the consequences of land degradation, including for freshwater systems. As an impact of land degradation the primary treatment of changes to freshwater systems is given in Chapters 4 and 5
Marcus Zisenis	Ch.3	General				As main driver should be also pointed out the consumer orientated societies which substitute real material values with psychological recognition values such as cars for driving as status symbol or shopping for recognition with severe land use impact for exploiting natural resources, monocultures for overproduction, etc.	We agree, but this issue is given a more in-depth treatment in Chapter 2, and for the sake of space we didn't feel it was necessary to repeat that information in chapter 3.
Sandhya Chandrasekharan	Ch.3	General				I wonder if the chapter should also include an examination of GM crop-growing areas in connection to the claim that they help decrease inputs (and subsequent detrimental effects on soil) without diminishing yields in the way organic agriculture would	Beyond scope of this chapter but GM crops are discussed at Chapter 3 level.
Marieke Sassen	Ch.3	General		General		Chapter needs language editing. In places sentences need to be restructured.	Entire text has been revised
Marieke Sassen	Ch.3	General		General		Referencing needs to be consistent throughout the text: either list all authors or use "et al." The placement of brackets (author and date or just date where appropriate) should be corrected. Initials are sometimes included.	Formatting of references was addressed in the final rendition of the text.
Marieke Sassen		General		General		Most of the text focusses explicitly on degradation drivers. Some sections in 3.4 have some description of how some direct actions and underlying drivers can support restoration, but this could be improved in others.	This chapter is focused on degradation drivers. Restoration is addressed in chapters 6 and 8.
Ingrid Hartmann	Ch. 3	General				The chapter does not consider inequality as the major driver for biodiversity and land degradation. Compare the work of Boyce, f. eg. Boyce, J. K. (2007). Is inequality bad for the environment? Working Paper Series, 135, 1-21 and others. Also Mikkelsen (2007): Economic Inequality Predicts Biodiversity. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0000444	Inequality is addressed by highlighting impact of over-consumption of most developed nations being most significant driver of degradation.
Ingrid Hartmann	Ch. 3	General				In general it could be discussed, if responsibility for environment and justice should be given to consumers to such a great extent, or if not already higher political levels should take over this responsibility in a much earlier stage.	Beyond scope of chapter, as this chapter deals with drivers. The topic of responsibility and justice has been addressed in Ch2.
Cantele, Matthew	Ch. 3	General				I was surprised to see no discussion of how integrated assessment models can potentially offer an alternative to reductionist single driver analyses. Perhaps the relative strengths and weaknesses of coupled models could be taken up in the conclusions.	Beyond the scope of chapter. This topic is more in line with the scoping of Ch7 where such elements are discussed.
Cantele, Matthew	Ch. 3	General				The chapter provides a rather extensive typology of LD drivers. The authors might benefit from reexamining the intended audience (including policymakers) and questioning whether such an exhaustive account is the optimal approach for this assessment and the desired impact of the deliverable.	We can not change the chapter structure this late in the process, but the Executive Summary of the chapter and the SPM serve to highlight the most important findings in the policy-relevant language.
Christophe CUDENNEC	Ch.3	General				Direct drivers are essentially technical ones with local and onsite focus, indirect drivers are essentially related to the socio-economic imbedment. I think an intermedicate level is lacking, hybrid between local endogeneous and regional/global exogeneous: landscape and geometric features/ processes which determine the functioning and some neighbouring/upstream-downstream inputs and outputs - these are roughly driven by global indirect drivers but impact the land parcels also, in addition to the local onsite technological drivers.	We disagree with this comment and prefer to treat only direct and indirect drivers, whilst allowing for feedback effects such as changes in landscape features.
UNCCD SPI	Ch.3	General				1. The Executive Summary is clear. 2. The chapter is very clearly written. 3. However, it is not good practice to refer to land uses as "drivers", as if they have lives of their own. The distinction between land use change and its anthropogenic drivers and controllers has been understood since land change science began to emerge as a distinct sub-discipline in the 1980s. The authors of the chapter may have been obliged to fit within terms defined by IPBES, but scientists reading this chapter will for this reason question its scientific robustness, and this will bring the scientific robustness of IPBES into question too.	An important point. We now only refer to types of management of different land-uses, not the land-uses themselves.

Pedro Mendoza	Ch. 3	General				General comments. Good information. Synthesize in some paragraphs	Thank you
Katalin Török	Ch.3	General				the Chapter should be shortened	This has been done for the final round
David Le Maitre	Ch.3	General				On invasions: There is a gap in your discussion on the role of development aid through aid agencies and NGOs in introducing tree and pasture species to many parts of the globe. Often for land rehabilitation and also to supply commodities such as fodder and fuelwood. A good example is the "wonder" organism myth - most of these species have turned out to do more harm than good in the medium to long-term. There are numerous examples globally and this has played a major role in invasions in many countries see for example Shackleton et al. 2014 (AoB PLANTS, DOI: 10.1093/aobpla/plu027) on Prosopis globally and in Africa. Historically, acclimatisation societies, forestry and agriculture played a major role, especially in the colonial era (as discussed in Ch 3 section 3.4.6.4). Fits in the category Outside policy intervention and should be explicitly included in the executive summary	We have now addressed this and explicitly referenced the role of development programs, including citing the Shackleton et al. 2014 study on Prosopis
David Le Maitre	Ch.3	General				On invasions: I am surprised by failure to adequately cover the invasion literature on many aspects of degradation, especially in combination with other drivers; you do cover disturbance as a facilitator but disturbance is not always required to drive invasions	Invasion is comprehensively addressed in the chapter
David Le Maitre	Ch.3	General				On invasions: The chapter does not adequately cover invasions particularly on introduction pathways which can be differentiated for example invasions pathways and clear distinctions can be made between accidental or deliberate and other distinctions - see Hulme 2015 J Appl Ecol 52: 1418-1424 for recent discussion. There is clear evidence that deliberate introductions from the colonial era through to modern times have been the key indirect driver of invasions - initially for species considered useful, more recently with massive growth in horticulture and the pet trade for example (see line 1512 onwards)	Additional text and references were added
David Le Maitre	Ch.3	General				Although you deal with invasive indigenous species in places (e.g. woody encroachment) this is hardly touched on in the summary and introductory section and should be given more prominence. A strong emphasis is placed on land degradation in the moist (forested) tropics and relatively little on the dry tropics and sub-tropics where there have been extensive changes in land cover - both losses and gains. An excellent analysis of the "drivers" in the Africa context is given by Campbell et al 2006 Ecol Econ 60: 75-85	Degradation of dry lands and in the sub-tropics is treated in multiple locations across the chapter
David Le Maitre	Ch.3	General				Given the global and particularly African importance of biomes where grasses are a key components (i.e. savanna and grasslands), there is very little discussion of degradation in these environments as opposed to the historical and euro-centric focus on forests and loss of forests. There are land-use transitions in these environments as well, especially with extensive areas being converted for farming crops for non-African countries. Much of this is recent, but given that a key aim of this assessment is to guide pre-emptive and forward looking interventions, this should be given more attention. Many of these areas have evidence of substantial woody encroachment possibly driven by increasing CO2 (as noted in the MS). These biomes and changes in them need to be given a greater weight.	This is an important issue which is addressed in the grazing land management section. One new table and a newly developed figure have now been included in the grazing land management section. The table shows the extent of permanent pastures and meadows by subregion and the grazing pressure in the two time periods of 2000 and 2009. The figure shows the trend in grazing lands globally and across five global regions of Europe, Asia, Africa, Oceania, and the Americas. In each of these figures we highlight what is going on at the level of region and subregion (as opposed to biomes) since that is what will be of most interest to policy makers. In chapter 3 we describe the direct and indirect drivers of land degradation and chapter 4 picks up on land degradation processes such as woody encroachment. Land conversion to croplands is addressed in the Croplands section. The pre-emptive and forward looking responses to land degradation are addressed in Chapter 6.
South Africa	Ch.3	1	1	96	3641	Very useful content, excellent document	Thank you
Shihai LV	Ch.3	2	44	2	47	These contents are not included in title, suggest be deleted.	We have revised the sub-titles of the chapter in the final report
Shihai LV	Ch.3	3	75	3	76	Insert "3.4.8" here.	Section headings have now changed.
Finnish Government	Ch. 3	3	76	3	76	Chapter/title for 3.4.8 is missing.	The table of contents has been revised and this will be fixed.
Finnish Government	Ch. 3	3	81	3	81	Industrial emissions / Deposition of pollutants should be considered as a direct driver.	Industrial emissions and deposition of pollutants are considered in Chapter 4. In Chapter 3 we examine in detail the drivers or human actions (e.g. industrialization, infrastructure development) on land degradation.

Mahmood Yekeh Yazdandoost	Ch.3	4	95	70	2333	Also the synergistic impact of planetary boundaries on BES.	Planetary boundaries are addressed in Chapter 2 and Chapter 7.
James Gambiza	Ch. 3	4	95	70	2333	This is an extremely well written chapter. Good use of diagrams and current literature. However, I have a few minor comments below.	Thank you!
Miguel Taboada	Ch. 3	4	95			Soil sealing by expansion of urban areas is another important cause of degradation. Was this considered? In such case drivers are increasing population and migration to the cities. I see it is included in Table 3.2, but I think that another related driver of land degradation is the outsource of land management when farmer migrate to the city.	Section 3.3.6 is focused on urbanization and also addresses soil sealing. Including due to in-migration from rural areas
Germany	Ch.3	4	96	7	247	The terms "direct drivers" and "indirect drivers" of land degradation should be introduced in the key messages of the executive summary as they appear in the title of the chapter but hardly in any of the key messages. The current parallel appearance of "direct drivers", "human activities", anthropogenic drivers", "underlying factors", "underlying drivers", and "indirect drivers" is confusing if there is no orientation regarding their correlation, e.g. indirect driver = underlying driver?	The introduction to the chapter opens with an explanation of direct and indirect (underlying) drivers. We have also now introduced the term direct and indirect more frequently in the Executive Summary text.
Marieke Sassen	Ch.3	4	96	7	247	Throughout the summary care has to be taken that new concepts and information are not introduced. If so it should be verified whether these perhaps indicate gaps within the main chapter text.	We have cross-checked the ES with the text to ensure that there are no gaps in concepts
Shenggong LI	Ch.3	4	96	7	247	some subtitles or classified thmemes are better	We prefer to keep the KMs as they are for consistency across the chapters
Astrid Hilgers	Ch. 3	4	98	4	98	Low-input farming can be a driver landdegradation. The negative nutrient balances of agricultural land in Africa are an example of that. High-input farming gives problems, especially if accompanied by high losses. References: 1. MacDonald, G.K., Bennett, E.M., Potter, P.A., Ramankutty, N., 2011. Agronomic phosphorus imbalances across the world's croplands. Proceedings of the National Academy of Sciences of the United States of America 108, 3086-3091. 2. A high-resolution assessment on global nitrogen flows in cropland. Proceedings of the National Academy of Sciences of the United States of America 107, 8035-8040. van Ittersum, M.K., et al. 3. Can sub-Saharan Africa feed itself? PNAS 2016 113 (52) 14964-14969, doi:10.1073/pnas.1610359113.	Point taken. We address this issue under discussion of land sparing and land sharing, see 3.6.2.3
Shenggong LI	Ch.3	4	101	4	104	Need rewording, too long and ambiguous	Text has been reworded for clarity
Marieke Sassen	Ch.3	4	102	4	103	"These drivers": I would refer here to the multitude of drivers that interact at different scales and among different parts of the globe and that shape our world today, creating significant challenges for efforts to both avoid and mitigate the causes of degradation and restore degraded land	Corrected to remove "these" and refer to the multitude of drivers
Cristobal Diaz	Ch 3	4	103	4	103	To add: "...and mitigate the drivers of degradation and restore degraded land and ecosystems "	This sentence has been revised.
Marieke Sassen	Ch.3	4	105	4	105	"...and some systems and areas... Delete "management"	Management deleted
Sandhya Chandrasekharan	Ch.3	4	107	4	122	very important points, well stated. Wondering about the mention of inconclusive	Our team designated the statement that "the globalized nature of many commodity supply chains potentially elevates the relative importance of global-scale factors such as trade agreements, market prices and exchange rates, as well as distant linkages e.g. related to buyer and investment preferences, over national and regional governance arrangements and the agency of individual producers" to be inconclusive. Inconclusive means that both the quantity and quality of the data and the level of agreement is low.
Germany	Ch.3	4	107	4	109	Compare with p. 5, lines 148-152: Key messages are partly repetitive, however using different terms/concepts of underlying factors/ drivers (=indirect drivers?). Recommendation: Better highlight the focus of each key message on its respective key aspect: globalized (spatially displaced) impacts in the first case and multi-causality in the second.	Clarified in text that we are referring to indirect drivers

Marieke Sassen	Ch.3	4	107	5	161	A lot of this text is about the multitude of drivers operating and interacting at different scales. The messages herein feel a bit repetitive. Especially main messages 2, 4 and 5, and the text below main message 3. See suggestions below.	We believe that whilst these messages are related they convey distinct messages; 2 is focused on telecoupling effects, 3 on context dependency (key to understanding phenomena like land sparing) and 4 on multiplicity of drivers (key for ensuring policy responses are not misplaced)
Marieke Sassen	Ch.3	4	107	4	122	This paragraph can be integrated with lines 148-161. Or more clearly split: one about globalisation explicitly (in the main message), which should then be integrated with lines 134-141, and one about land degradation being the result of multiple interacting factors etc., including lines 142-147	See response to previous comment. We believe these messages are sufficiently distinct. 107-122 is focused squarely on displaced effects and does not address multiplicity of drivers
Virginia Meléndez Ramírez	3	4	107	4	109	The word restoration can be deleted	We prefer to keep the word restoration
NFP of China	chapter 3	4	109	4	111	Does not meet the actual situation in China, we recommend to delete "China"	Sentence changed to now read "Demand for food imports is increasing across much of the world ..." following language agreed in SPM para 18 and not referring to specific countries
Astrid Hilgers	Ch. 3	4	112	4	113	please rephrase the part where it says: use of natural resources is 3x physical quantity of traded goods, it is not very clear.	Sentence has been rephrased and is now clearer
Astrid Hilgers	Ch. 3	4	114	4	114	more attention should be paid to the fact that the lack of (enforcement of) legal regulations for sustainable land use is one of the indirect drivers for land degradation	Importance of enforcement of regulations is now emphasized more in the third key message
Marieke Sassen	Ch.3	4	118	4	120	"...elevating the relative importance [...] producers": I agree that this is inconclusive and I do not think the chapter gives enough concrete indication that this might be the case to state this. I think the previous statement is sufficient in this regard, lines 114-117. In fact, what the chapter does illustrate, rather than global scale factors becoming more important per se than more local factors, is that they interact for different outcomes in different contexts: the influence of global factors on outcomes depends very much on the nature of relevant local factors/the local context. See also Chapter 4	We partly agree with this comment, as indicated in other places, "globalization" does not necessarily mean "global scale". A bilateral relation between and Brazilian producer and a Chinese buyer is part of "globalization". So it's both (i) global scale factors as well as (ii) distant, more "horizontal" linkages. Sentence now modified to clarify this, and remove any suggestion that this statement is conclusive.
Finnish Government	Ch. 3	3	123	3	124	The sentence might be a bit hasty conclusion of the interlinkages between poverty - demand induces natural resources extraction - economic growth. Partly contradicts lines 1877-1879.	Additional sentence for this key message added to read "Extreme poverty, combined with resource scarcity, can contribute to land degradation and unsustainable levels of natural resource use, but is rarely the major underlying cause (well established)"
Cristobal Diaz	Ch 3	4	123	4	124	I disagree with affirmation: "Economic growth, not poverty, is one of the biggest threats to sustainable land management globally (established but incomplete)". I think that both are main drivers for land and ecosystems degradation. I suggest a redaction as: "Economic growth, interrelated with poverty , is one of the biggest threats to sustainable land management globally (established but incomplete)"	This has been nuanced to read: "Economic growth and per capita consumption, more than poverty..."
Sandhya Chandrasekharan	Ch.3	4	123	4	124	Thank you for saying it plainly. Maybe the authors of Chapter 2 need to be in discussion with those of Chapter 3?	Thank you
Marieke Sassen	Ch.3	4	123	4	124	Add either in main message or in text below that, yet, economic growth, especially at national to global scales, might also be one of the biggest opportunities for restoration, as is illustrated in the chapter. It is this seeming contradiction and what happens in the mean time which will determine long term outcomes and where action needs to take place.	This point has been emphasized in the final key message
Marieke Sassen	Ch.3	4	125	4	133	This explanation needs to give more specific established evidence to support the main message about poverty vs economic growth, also, to better support the conclusion in the last sentence.	More explanation has been added to this message
James Gambiza	Ch. 3	4	129	4	129	Delete the expression "ecosystem clearance". The expression is not logical. How do you clear an ecosystem?	Changed to read clearance of native vegetation
Gunay Erpul	Ch.3	4	131	4	133	Is this really doable? I think there is a contrast here between globalism and local and regional strategy improvements! How could it be done regardless of global economic push?	This statement summarizes the necessary conditions for change, not the likelihood of change occurring
Diana Patricia Alvarado-Solano	Ch.3	4	131	4	133	What is the cause for the poverty? Because the agricultural intensification and expansion can lead to an environmental displacement events. Which forces the peasants and families living in the countryside to move out to the big cities increasing the social problems and poverty belts in there. It would not better to recommend different food production schemes, such as those presented in the Chapter 2?	Agreed. We have emphasized the importance of pro-poor food production schemes

Astrid Hilgers	Ch. 3	4	132	4	132	Poverty alleviation is mentioned here as an effort for restoration but not explained how that works. Instead it could also be argued that economic opportunities are of more importance.	Impact of poverty on degradation is now more clearly explained at the start of the message, giving context as to why it is important to address poverty
Virginia Meléndez Ramírez	3	4	134	4	136	The word restoration can be deleted	We prefer to keep the word restoration
Katalin Török	Ch.3	5	143			possible TO make general predictions	Corrected.
Sandhya Chandrasekharan	Ch.3	5	148	5	154	good lines	Thank you.
Steve Prince	Ch. 3		158		159	The only annual grasses I am aware of is Bromus tectorum (cheat grass) which is an ephemeral weed. While often a problem it cannot be said to replace rangeland landscapes.	Evidence presented in the chapter supports this message
Steve Prince	Ch. 3		160		161	Cite Chapter 2 on this.	Several chapter could be cited at the end of this sentence since it addressed policy responses. We feel it's better to not cite Chapter 2 here.
Astrid Hilgers	Ch. 3	5	162	5	170	how do the two examples given in this paragraph, on two different activities, being deforestation and game-hunting relate to the paragraph's its 'title' that the same activity can have different impacts. What is the point of the paragraph?	This message has now been removed from the executive summary
Shenggong Li	Ch.3	6	165	8	276	Better to be described by some subtitle or key words for each paragraph	Subtitles are not used to maintain consistency between chapter formats
Finnish Government	Ch. 3	5	168	5	170	The sentence is not clearly established. Game hunting in urban area? Or consumption of hunted meat? To be clarified.	Text has been removed.
Steve Prince	Ch. 3		171		171	"Inappropriate" limits the problem to obviously poor management; in fact most agriculture is an extensive driver. Maybe delete?	Sentence modified to read rapid expansion and inappropriate management to highlight that both these two aspects are important.
Cristobal Diaz	Ch 3	5	176	5	176	Change the word occur by are in : " Over half of natural grazing lands are in dryland environments	We see no difference. The final text has been extensively revised.
Gunay Erpul	Ch.3	5	177	5	183	Then pollution as land degrading problem would be at stake! Nitrogen and other sources of diffuse pollution have negative effects on both terrestrial and aquatic ecosystems.	Comment unclear, no change made.
Nathalie van Haren	Ch.3	5	178	5	178	The reference of statement "Globally, fertilizer and pesticide ure is expected to double by 2050" in 3.4.1. is not found in paragraph 3.4.1.	Reference to chp section revised to read 3.3.2.2 (citing Tilman et al. 2001).
Astrid Hilgers	Ch.3	5	178	5	178	The reference of statement "Globally, fertilizer and pesticide use is expected to double by 2050" in 3.4.1. is not found in paragraph 3.4.1.	Reference to chp section revised to read 3.3.2.2 (citing Tilman et al. 2001).
Cristobal Diaz	Ch 3	5	178	5	178	To change by UN classification: "... is particularly severe in small island developing states (SIDS) and principalities "	This was changed
UNCCD SPI	Ch.3	5	178	5	178	The reference of statement "Globally, fertilizer and pesticide ure is expected to double by 2050" in 3.4.1. is not found in paragraph 3.4.1.	Reference to chp section revised to read 3.3.2.2 (citing Tilman et al. 2001).
Steve Prince	Ch. 3		179		179	Maybe include phosphorus?	Phosphorus is included as part of fertilizer.
Astrid Hilgers	Ch. 3	5	181	5	181	please stress the importance of a combination of measures for sustainable land management. There is not one silver bullet. Preservation of soil organic matter is important but without additional supply of mineral fertilizer it may not be sustainable on its own.	Edited to refer more generally to the need for sustainable agricultural practices
Astrid Hilgers	Ch. 3	5	181	5	181	Drops in NUE in combination with excessive fertilizer application foremost underscore the importance of sound agronomic practices, like calculating nutrient balances to check whether the application of (extra) fertilizer is still effective in increasing yield and nutrient offtake.	Agreed, this comment is not inconsistent with the text.
Marieke Sassen	Ch.3	5	182	5	183	Is low tillage not part of conservation agriculture? None are mentioned in the rest of the chapter by the way. Better would be to say something with regards to the needs for improved agronomic practices , including better integration of crop and livestock systems, increase contribution of symbiotic N fixation using legume crops. (Even though, again there is no discussion of ways to increase N use efficiency in the relevant section 3.4.2.3)	Edited to refer more generally to the need for sustainable agricultural practices
Astrid Hilgers	Ch. 3	6	185	6	198	An overall picture of how forests are affected by human activities is missing. On the one hand, agriculture is 'invading' into relatively intact tropical forests (line 190) while on the other hand forest products for human use raise pressure on native forests (line 197). So, what is known about the overall effects on native/natural forests?	The overall changes to forests are addressed in Chp 4

Marieke Sassen	Ch.3	6	185	6	198	Suggest moving up this paragraph to be the second one in the Summary for better flow	We think the flow is better with the original order.
Gunay Erpul	Ch.3	6	193	6	193	represents - to represent	Changed.
Cristobal Diaz	Ch 3	6	195	6	195	To add: "Under current projections efforts to intensify wood production in plantation forests with energetic uses...."	
Marieke Sassen	Ch.3	6	197	6	198	Specify that this relates to wood production	The sentence applies to sustainable production in general.
Finnish Government	Ch. 3	6	198			The growth of certified forests has not been observed to slow down. The expansion in surface area ?	Changed.
Steve Prince	Ch. 3		199		200	The status and trend aspects of this and the following three topics are dealt with in Chapter 4 (e.g. fire in 4.2.6.5.) Be sure to cite these in the main part of this Chapter.	No change needed.
Yildiz AUMEERUDDY-THOMAS	Ch.3	7	200	Line 201	201	from community to community? I guess it would be more appropriate from a social perspective to say "from one social group to another social group"	Cannot find this sentence, no change needed.
Yildiz AUMEERUDDY-THOMAS	Ch.3	7	206	Line 207	207	" economic, demographic and political factor": socio-cultural factors also play a major role	Cannot find this sentence, no change needed.
Thomas Brooks	Ch.3	6	210	6	211	Maybe change "prohibitively" to something like "is often very". The general point is well-taken, but "prohibitively" implies an inevitability that is not warranted - witness successes in eradications from progressively larger islands, as well as the promise of new techniques and technologies to reduce costs	Changed
Gunay Erpul	Ch.3	6	213	6	226	At the current rates of urbanization, loss due to soil sealing may double in the next 20 years and even triple in developing countries by 2030.	Reference missing to support reviewer's comment.
Gunay Erpul	Ch.3	6	213	6	226	Soil sealing: the drivers are essentially not only demographic growth but also economic.	Clarified that this refers to economic development as well.
Astrid Hilgers	Ch. 3	6	221	6	221	complex sentence, should be simplified (for example: population will increase, but population densities will remain the same. More people will thus lead to bigger cities.)	Sentence edited to be simpler.
Gunay Erpul	Ch.3	6	225	6	225	shows - show	Changed
Astrid Hilgers	Ch. 3	6	225	6	225	If urban areas replace former natural ecosystems (ine 217), it is hard to believe that green technology can restore this ecosystem function	Agreed. Sentence modified to say that green technologies can only help restore some services.
Gunay Erpul	Ch.3	6	227	6	227	its ability - its role	Changed.
Miguel Taboada	Ch. 3	6	227	7	236	Higher rainfall and land clearing also influence groundwater dynamics and may cause soil salinization	Not added here due to space restrictions.
Yildiz AUMEERUDDY-THOMAS	Ch.3	7	231	Line 233	233	To be more precise, we should refer rather than ancient to: land management technologies developed both by "ILK systems and or Modern scientific approaches" Some technologies still require more scientific enquiry and research to be able to create synergies between ILK systems and Modern Technologies". This synergy does not exist yet.	Cannot find this sentence, no change needed.
Cristobal Diaz	Ch 3	7	231	7	233	To add: The exacerbating effect of climate change on the impact of degradation drivers, including land-clearance and intensive farming techniques, can be felt both through chronic impacts and directional changes - like temperature changes, sea level rise , leading to shifts in species range sizes, as well as changes in average precipitation levels, atmospheric CO2 and nitrogen deposition - and acute impacts through extreme weather events of flooding and drought, and other natural disasters (well established).	In the climate change section of the chapter we did not specifically address sea level rise. Thus we do not feel comfortable including that in the summary. We did, however, add "an other natural disasters"
Gunay Erpul	Ch.3	7	236	7	236	soil erosion and landslides	Changed.
Gunay Erpul	Ch.3	7	237	7	247	SDGs and LDN can be issued.	Noted.
Sandhya Chandrasekharan	Ch.3	7	237	7	241	This is just the summary, I know, but this seems a bit overstated (as important as it is to capture the good examples). It would be good if the body of the chapter discusses the actual numbers/ impacts/ scale in more substantial ways	Space restrictions prevent more in-depth treatment, some more coverage is given in Chp 8.
Germany	Ch.3	7	237	7	237	Provide a definition of "sustainable land use" to ensure that this term is not used interchangeably for "sustainable land management".	Sentence modified to read "land use and land management"
Germany	Ch.3	7	239	7	245	The use of the terms "hundreds of companies" and "many governments" is too general. Provide concrete references which show examples of the pledges companies have made and of governments or finance sector commitments to counteract environmental harm.	Additional detail and reference added to section 3.6 to support this statement.
Marieke Sassen	Ch.3	7	246	7	246	There is no other mention of the bio-economy in the text so I would remove it from here	Changed to remove bioeconomy
Marieke Sassen	Ch.3	7	247	7		Clarify what are "demand-side" commitments for sustainable land-use. Or do you mean "demand-driven"? Or "supply-side"? (from the text I think the latter)	Clarified as referring to consumer driven

Virginia Meléndez Ramírez	3	8	248	8	248	Other chapters start with the introduction, you can standardize chapters	We have renamed the first section 'Introduction' to standardize across chapters.
Marieke Sassen		8	249	8	268	This section needs work. In fact, the text on line 315 to 332 is a much clearer introduction to this chapter. I would strongly suggest replacing the current text with that (with adaptation if deemed necessary)	We have now substantially revised this introductory session. As suggested we moved text from later on in the document that were more appropriate for the introduction to the start, adapting it as required.
Marieke Sassen	Ch.3	8	250	8	252	This information is repeated in lines 258-259	This section has now been substantially revised, and the repetition removed.
Marieke Sassen	Ch.3	8	251	8	251	delete "a good" (the quality of life declines, it is irrelevant if it was good). Similar line 259	Words have been deleted as suggested
Yildiz AUMEERUDDY-THOMAS	Ch.3	8	253	Line 254	254	"traditional knowledge systems ": same as above, better put indigenous and local knowledge systems	It is unclear what this comment refers to as there is no reference to traditional knowledge systems in this line. However, we have replaced other instances of traditional knowledge systems with 'indigenous and local knowledge' (e.g. in Table 3.2).
Virginia Meléndez Ramírez	3	8	257	8	268	The definitions are already in the Box 3.1	We have now revised the text to largely avoid repetition. The definitions are now provided primarily in the box.
James Gambiza	Ch. 3	8	257	21	577	The authors give an excellent discussion of direct and indirect drivers together with examples of their interactive effects. Definitions of the drivers and some of the examples described in this chapter should be included in the Key Messages in the Summary for Policy Makers (SPM) chapter to improve the clarity of the SPM.	Due to space limitation in the SPM, we were unable to provide the definitions to direct drivers. However, there are many pointers in the SPM as to where a reader may be able to find these definitions.
Steve Prince	Ch. 3		257		263	The inclusion of natural, biophysical causes is at variance with the LDRA scoping and with Chapter 4 (see pp410-415). In fact, the treatment of this point should be strengthened in Ch 4. But first we need to agree that this assessment is only concerned with anthropogenic degradation (although sometimes exacerbated by environmental conditions - static or changing).	The outline for chapter 3 in the scoping document states: "This chapter will assess how land degradation and restoration is the result of multiple drivers, involving both direct anthropogenic and natural factors and interactions between them, as well as underlying indirect drivers." Nevertheless, we do not discuss natural drivers in any detail, besides pointing out that they can be a cause for degradation.
Shenggong LI	Ch.3	8	258	8	258	"to result in to" --> "result in"	This has been corrected
Yildiz AUMEERUDDY-THOMAS	Ch.3	8	258	Line 258	258	As said earlier: incorporating ILKs should be coupled to a better recognition of rights of access to land as well as local governance system.	Agreed that this is a good point but it's not clear based on the lines in the text has this comment related to line 258.
Cristobal Diaz	Ch 3	8	261	8	261	"Direct natural drivers are those that are not the result of human activities (e.g. landslides, tectonic activity) and are beyond human control..." - I disagree with the example of landslides because a great part of these are provoked by the man when realize the deforestation of slopes, and the examples of tectonic activities depend because it is demonstrated that cracking seek oil influences over this process.	We agree that natural drivers may also be driven or interact with human activities. For our purposes here we are following IPBES definitions of natural and anthropogenic drivers.
Gunay Erpul	Ch.3	8	262	8	262	land clearance, accelerated soil erosion,	We only discuss direct drivers (i.e. human actions here). The implications of these actions in terms of biophysical processes (e.g. soil erosion resulting from land clearance) are dealt with in chapter 4.
Marieke Sassen	Ch.3	8	264	8	268	"Indirect drivers, on the other hand, are those that...direct drivers": this sentence is repeated multiple times in the text. See also line 307 and Box 3.1. A simpler version (especially for an intro to the chapter) would be: "Indirect drivers, on the other hand, are factors that underpin direct drivers of change, such as institutional and governance structures [...] occurs. They are external (exogenous) to the ecosystem under consideration (MEA 2015)." Or even better use text from lines 321-326. But first see comment below.	We have now revised the text in this section based on all comments received, and have removed repetition.
Steve Prince	Ch. 3		266		266	Modelers and others refer to these as "state variables", that is they are constant when considering the finer scale, here the processes invoked by direct drivers.	The terms and definitions in the LDRA are somewhat different from those of the modeling community. The LDRA framework loosely follows the DPSIR (Drivers, Pressures, State, Impact, Response)
Marieke Sassen	Ch.3	8	269	8	269	before the "thorough examination"there is an overview (3.2.) not worth mentioning?	We have rephrased this sentence now to mention that we first provide a broad overview of the different direct drivers followed by a detailed examination of each.
Marieke Sassen	Ch.3	8	270	8	270	Indirect drivers, human actions and decisions (so basically all anthropogenic drivers right?): I would say they PROVIDE the mechanism, not that they ARE (especially indirect drivers)	We have rephrased this sentence as suggested, and now state that indirect drivers 'provide' the mechanism to halt and reverse degradation.

Marieke Sassen	Ch.3	8	271	8	271	Surely not just altering the rate of change of direct drivers but the direct drivers themselves?	We have revised this sentence and now state that altering the nature, extent and rate of change of direct drivers to promote restoration can be achieved through indirect drivers.
Marieke Sassen	Ch.3	8	273	8	273	Confusing: "policies etc."refers to the indirect drivers right? It sounds like it refers to interventions (policies and institutional structures are not interventions).	We have rephrased this sentence to remove the confusion, and now state "through interventions including changes to policies, governance and institutional structures, and markets".
Marieke Sassen	Ch.3	8	275	8	275	Odd transition. Say that you will be looking at direct drivers in the next section of the chapter upfront	The order in which we discuss direct and indirect drivers has now been changed - we discuss drivers drivers first, and then indirect drivers. As a result, the transition is now much smoother.
Marieke Sassen	Ch.3	8	276	8	276	"and the underlying indirect drivers of land degradation". Make clear that these are the underlying drivers of those specific direct drivers you are focussing on. Bit confusing now (because earlier paragraph said it dealt with underlying drivers)	To avoid any confusion, we have removed this bit of text from this sentence in the revised version of the chapter. We discuss ndirect drivers in the next paragraph.
Cantele, Matthew	Ch. 3	8	286	9	306	Endogeneity and exogeneity have different meanings to different audiences (statiticians, modelers, policy-makers. It may be worth clarifying their meaning here.	To avoid confusion, we no longer use the terms 'endogenous' or 'exogenous' here.
Steve Prince	Ch. 3		286		289	See comment on natural, biophysical changes lines 257-263.	As pointed out in the response to the earlier comment mentioned here, we do not discuss natural drivers in any detail, besides pointing out that they can be a cause for degradation.(We also note that the outline for chapter 3 in the scoping document mentions both direct anthropogenic and natural factors.
U.S. government	Ch.3	9	293	9	293	Road building in sloping land is by far the greatest cause of landslides and other mass movements. While clearcutting may be an issue in young landscapes, it is not a widespread problem except for the construction of haul roads.	We now also mention road building here.
Marieke Sassen	Ch.3	9	296	9	296	Contradiction: here direct drivers are considered the most severe drivers of LD, but line 306 makes it sound like indirect drivers are	We appreciate that the use of the phrase 'most...severe' here can be a source of confusion. We have now rephrased the sentence and revised the text in this section. We do not discuss severity of drivers here, but restrict ourselves to discussing the proximate (direct drivers) and ultimate (indirect drivers) causes of land degradation.
Marieke Sassen	Ch.3	9	297	9	299	From "Direct anthropogenic...": not a very informative sentence. I would delete and attach the next paragraph here (from line 300).	We have now removed this sentence and revised the text as suggested.
Steve Prince	Ch. 3		301		301	...to regional (e.g. invasive species and global (e.g. climate change) scales...	We have incorporated this suggestion to provide separate examples for regional and global scales.
Marieke Sassen	Ch.3	9	303	9	303	multiple interacting drivers	Text revised as suggested.
Marieke Sassen	Ch.3	9	303	9	308	Order of topics not the same as in the rest of the text	We have now restructured the chapter to discuss direct drivers first followed by indirect drivers. The order of topics here is now the same as the rest of the text.
Marieke Sassen	Ch.3	9	304	9	304	multiple interacting drivers	Text revised as suggested.
Steve Prince	Ch. 3		306		308	Somewhat repetitive? See lines 264 ff.	The earlier text referred to here (lines 264-) has now been removed to avoid repetition. There is some similar text in Box 3.1 where different terms are defined, but we have chosen to retain this sentence here in order to maintain the flow of the document.
Marieke Sassen	Ch.3	9	307	9	308	Repeated in Box 3.1. Bit clumsy. Find a different, slightly more detailed formulation. E.g using line 321 onwards (p11).	We have revised this text, and believe it is now less 'clumsy'. Also, the text from line 321 onwards, now appears earlier (in section 3.1).
Gunay Erpul	Ch.3	9	309	9	310	To the title of Box 3.1 "Definition of degradation drivers in the context of the IPBES framework", LDRA could be added as "Definition of degradation drivers in the context of the IPBES LDRA framework". This definition might slightly vary from other IPBES assessments!	We have now revised the title of Box 3.1. to state that these are the definitions of drivers in the context of the IPBES LDRA framework
Marieke Sassen	Ch.3	9	309	9	310	Box 3.1. "Anthropogenic direct drivers". It looks as if the text: "namely, of institutions and [...] other indirect drivers" is in the wrong place. Or there is a piece of text missing that makes the link with the direct drivers. I would add and actions after "decisions"	We have removed the reference to the indirect drivers here (institutions and governance systems) as it can be a source of confusion as pointed out. We have also added 'and actions' to the sentence and additionally provide examples of direct anthropogenic drivers now for clarity.

Javier Ernesto Cortés Suárez	Ch.3	9	309	9	309	Box 3.1-These definitions are related to the disturbance theory in restoration ecology? I think these should be clarified, as well as to include other concepts related to degradation such as disturbance, stressor, disturbance regime, among others.	The definitions in Box 3.1 are as per the IPBES Conceptual framework (see Diaz, S., et al (2015). The IPBES Conceptual Framework—connecting nature and people. Current Opinion in Environmental Sustainability, 14, 1-16.). Unfortunately, due to word length restrictions we are unable to define other concepts related to degradation such as disturbance regimes etc. here. These terms are clarified, as required, where they are used in the rest of the assessment.
Shenggong Li	Ch.3	9	309	9	310	"Natural direct drivers" is not well defined	We have now provided examples to clarify 'natural direct drivers'
Germany	Ch.3	9	309	9	310	Box 3.1. Definition of degradation drivers in the context of the IPBES framework: Definition of Anthropogenic direct drivers is not conclusive: "Elements of direct drivers that are the result of human decisions, namely, of institutions and governance systems and other indirect drivers". Please explain/specify "other indirect drivers" in this context ("Anthropogenic direct drivers").	We have removed the reference to the indirect drivers here (institutions and governance systems) as we recognize that it can be a source of confusion. We additionally provide examples of direct anthropogenic drivers now for clarity.
Gunay Erpul	Ch.3	10	311	10	312	Examples (3rd Column Title)	This has been corrected
Gunay Erpul	Ch.3	10	311	10	311	Other than Table 3.1, all over text some more issues may be for soil pollution and contamination in interaction to fertilizers, petroleum products, pesticides, herbicides, mining, heavy metals, radioactive contamination. Non-point soil pollution, industrialization. Ways to contain contamination degradation to partly eliminate hydrocarbons (decomposition and bio-remediation using some grass species). Improved regulatory systems, policies to ensure sustainable soil management.	Our focus in this chapter is primarily on the nature and extent of the different direct drivers of land degradation (e.g. non-timber harvest, grazing land management). The implications of these actions in terms of biophysical processes (e.g. soil erosion resulting from land clearance) are dealt with in detail in chapter 4. However, we briefly mention these in Table 3.1 primarily to provide continuity to chapter 4.
Thomas Brooks	Ch.3	10	311	10	311	Explain in the legend the classification on which Table 3.1 is based. Salafsky et al. (2008) Conserv Biol provides an excellent and widely-used such classification, that could usefully be incorporated here. Also Page 26 (Lines 738-748).	Definitions of drivers and their classifications were developed by IPBES and included in the IPBES Conceptual Framework. This assessment is anchored around the IPBES conceptual framework and the classification of the different drivers and their definitions are shared across IPBES assessments
Marieke Sassen	Ch.3	10	311	10	312	Table 3.1.. First column: Not all elements listed are drivers as suggested by the title of the column: Grazing lands, Croplands and agroforestry, Forests and tree plantations. They are the focus of or result of direct drivers (e.g. grazing land management). Second column: "spatial planning" is listed multiple times. It is a lot more general than the other subcategories listed. Third column: despite the title, there are no examples of restoration processes listed (some "changes listed could be positive of course but the overall impression is of mainly degradation)	We have revised the text in the first column to more accurately describe the drivers (e.g. grazing land management, cropland management etc). We have also removed spatial planning from the second column as we agree that it is a lot more general than the other examples provided. We have deleted "restoration" and it now reads "linked degradation processes"
Virginia Meléndez Ramírez	3	10	311	10	311	Table 3.1. The word restoration can be deleted.	Deleted.
James Gambiza	Ch. 3	10	311	10	311	Table 3.1: Fire regime should also include season or timing of fire.	We have revised the entry in the table to also mention season and timing of fire.
U.S. government	Ch.3	10	311	10	312	Table 3.1, no restoration processes are listed	Restoration has been deleted from table 3.1
U.S. government	Ch.3	10	311			In Table 3.1, Anthropogenic direct driver: Stream Corridor alterations and/or disturbance. The hydrology and hydraulics, and fluvial processes drive the ecological river or stream system. The river is always at work and varies significantly during various flow stages. When we alter or degrade the river system it has long term impacts on the community, wildlife, and aquatic assemblages that live and rely on streams and rivers. Floodplains should be addressed in this document. Riparian plant communities, fish resources, and drinking water are all impacted by anthropogenic perturbations of the stream corridor.	Chapter 4 section 4.2.5.1 Hydrological Degradation deals with hydrological alterations. Although stream corridor alteration is more of a degradation process covered in Chapter 4. In Chapter 3, human drivers such as stream corridor alteration is a result of a range of activities such as mineral extraction and energy development, infrastructure and industrialization, and invasive species introduction.
Steve Prince	Ch. 3	Table 3.1	311	311	311	"Introduction of invasive species..." There could be sub-categories such as diseases, pest species, plants, insects, carnivorous animals....	Pests and disease were added to this table. Introductions of plants, insects, and carnivorous animals would all fall under changes in species composition as the linked degradation process.
Steve Prince	Ch. 3	Table 3.1 line 311	311	311	311	I like this.	Thank you.
Mahmoud Awad Mekki	Ch. 3	11	311		311	Table 3.1 Row 1, column 2 rotation and/or sequence	We believe the term 'rotation regimes' also includes sequence, and so have not revised the entry.
Mahmoud Awad Mekki	Ch.3	11	311		311	Table 3.1 Row 2, column 2 crop type and rotation and/or sequence	We now mention crop rotation and sequence in the entry

Cantele, Matthew	Ch. 3	11	313			It may be worth explicitly including consumption within the driver table	Consumption is now included in the Table
Shenggong LI	Ch.3	11	313	11	313	Science, knowledge and technology are not discussed fully in context	We feel that these topics are given adequate consideration in this section. Further treatment can be found in Chapters 2 and 8
Cristobal Diaz	Ch 3	11	313	11	313	I suggest the inclusion of capacity-building in " Science, knowledge and technology "	Capacity building is one way in which organization improve knowledge, so capacity building would be one approach to change knowledge
Mahmoud Awad Mekki	Ch.3	11	313		313	Table 3.2 Row 1, ccolumn 2 population growth should be changed to population increase or population growth rate	Change accepted
Mahmoud Awad Mekki	Ch.3	11	313		313	Table 3.2 Row 1, ccolumn 2 migration either change to seasonal migration or poulation mobility (Rural rural and Rural urban)	Change accepted
Mahmoud Awad Mekki	Ch.3	11	313		313	Table 3.2 Row 3, column 2 local and traditional knowledge should be written indigenous and local knowledge as traditional knowledg denotes to both	Change accepted
Mahmoud Awad Mekki	Ch.3	11	313		313	Table 3.2 Row 5 colum 2 add food taboo	Change accepted, taboos added
Shihai LV	Ch.3	11	314	70	2333	Unify the references citation in text, for example .	Comment unclear
Marieke Sassen	Ch.3	11	315	11	332	This is general introduction text, not specific to Indirect drivers of land degradation, and should be moved to section 3.1, where it will improve current text.	This general introduction text has been moved to section 3.2 which covers the overview of all drivers
Cristobal Diaz	Ch 3	11	315	11	317	I suggest the conciliation of explanation of a driver of environmental change with the drivers of land degradation explanation that is shown in point 3.1. Purpose and value of chapter	Text has been moved to section 3.2
Gunay Erpul	Ch.3	11	333	14	392	Few lines on "the effects of "Globalism" on indirect drivers could help"	Globalization is treated in depth in section 3.6.4
Mahmood Yekeh Yazdandoost	Ch.3	11	334	14	392	Also explanation on synergistic impact of all the indirect drivers coupled with climate change.	Climate change interaction effects with direct drivers is given extensive treatment in section 3.6. Climate change itself is not an indirect driver of degradation
Marieke Sassen	Ch.3	11	336	11	337	Table 3.3.1 (should be 3.3.) does not explicitly show these 5 sets of factors. Delete reference to this table here.	Reference to Table is updated
Shenggong LI	Ch.3	11	337	11	337	Table 3.3.1 is not found	Reference to Table is updated
Sandhya Chandrasekharan	Ch.3	12	342	11	343	just flagging here that "shift in demand" and "market access" therefore needs to factor in ecological costs - perhaps to figure in the recommendations/ concluding discussion? - that is what the institutional/political factors need to do differently	Economic incentives to address externalities and ecological costs are addressed in Chapter 6
Marieke Sassen	Ch.3	12	347	12	347	hard return before "Technological factors", this way the list on line 336 is easily recognised (a paragraph per set of factors)	Change accepted
Marieke Sassen	Ch.3	12	350	12	350	The use of "Whilst" does not rhyme with the fact that it is then said that technological factors can either have a positive or negative effect. There is no opposition here (implied by "whilst") as "transformative can always be either negative or positive.	Change accepted
Katalin Török	Ch.3	12	350			through new forms..	Change accepted
Marieke Sassen	Ch.3	12	353	12	353	Clarify how Table 3.3. illustrates the previous statement	Table has now been revised with new content and including examples of land restoration
Marieke Sassen	Ch.3	13	354	13	354	Table 3.3. This table was taken from Lambin et al. 2003. Delete "THE" before "causes of land-use change". The original authors did not mean for this to be a comprehensive overview of all causes. Please consider using "drivers" instead of "causes" (Lambin et al language) as this is more consistent with the wording used in this chapter so far. Delete "and associated [...] processes" as these are not shown in the table.	Changes accepted
Virginia Meléndez Ramírez	3	13	354	13	354	The word restoration can be deleted, check where the word restoration is not necessary	We have kept the word restoration as "changing market opportunities", "outside policy interventions" and "changes in social organization" are all relevant to restoration as degradation
Gunay Erpul	Ch.3	13	355	13	355	1st Column heading could be "rate of change" (Slow, Fast)	Change accepted
Mahmoud Awad Mekki	Ch. 3		355		355	Table 3.3 end of column 4: Risks associated with hazard has to be reversed to hazards associated with risks as hazards come after the risks	Change accepted

						Barbier and Hochard have crossed changed in populations with changes in land use state: Barbier EB, Hochard JP (2016) Does Land Degradation Increase Poverty in Developing Countries? PLoS ONE 11(5): e0152973. doi:10.1371/journal.pone.0152973 4 types of areas: <ul style="list-style-type: none"> • increasing populations on degrading agricultural land • decreasing populations on degrading agricultural land • increasing populations on improving agricultural land • decreasing populations on improving agricultural land It may be worth to cite them as they quite neatly summarise the different results that have been demonstrated by previous literature.	New sentence added referencing the work by Barbier and Hochard and referencing their work
Emmanuelle Quillérou	Ch.3	14	360	14	363		
U.S. government	Ch.3	14	368	14	392	Corruption, elite capture, and insecure tenure should be mentioned as well.	Change accepted
Douglas, Diane	Ch. 3	14	375	14	392	Consider adding contributors of poverty and corruption. For example illegal logging is more attractive economically for some people/groups due to greater return on labor investment; and some political leaders & police do not enforce environmental laws designed to stop deforestation because of lucrative payoffs.	Additional text and references on corruption added to 3.6.2.1
Virginia Meléndez Ramírez	3	14	376	14	376	communities change by human communities.	Change accepted
Katalin Török	Ch.3	14	379			citation format	Citation formatting were finalized in final rendition of the text
Marieke Sassen	Ch.3	14	383	14	385	Rephrase beginning of sentence does not fit with end (sounds like dietary change will override the risk of LD)	Change accepted, rephrased
Ingrid Hartmann	Ch. 3		383			If consumer behaviour is discussed, also the fact, that it needs more area to produce one kg of meat than it needs to produce one kg of cereals should be discussed, while distinguishing that meat produced on absolute grasslands give food which otherwise could not be accessed by humans and not be used otherwise, therefore adds to overall food production, which is the contrary for industrial meat production, which reduces overall areas for food production (in comparison to if cereals would be produced there.)	This is now addressed explicitly in section 3.3.2 on croplands
Katalin Török	Ch.3	14	385			citation format	Citation formatting were finalized in final rendition of the text
Marieke Sassen	Ch.3		386		392	Move this paragraph to the end of the next section (line 402) for a logical flow (as it really refers to what's in Table 3.3.), and whilst addressing the next 4 comments.	Change accepted
Marieke Sassen	Ch.3		387		387	It says the complexity of indirect drivers is not completely irreducible but on line 395-396 it says they do not lend themselves to reductionist analyses. Sounds contradictory.	Rephrased to show that there is complexity but not completely irreducible
Marieke Sassen	Ch.3		389		389	Lambin et al do not identify a "highest level", just high level causes. Just start the sentence at "Lambin et al (2033) identify etc." You may want to swap causes for drivers again here for consistency.	"At the highest level!" was removed
Marieke Sassen	Ch.3		390		390	"and hence associated LDR processes": where are these associations described? Not in Table 3.3 that this sentence really refers to (even though it doesn't in the text).	This part was simply removed. The previous parts of the Chapter already make it clear that land use change here is of concern as being a driver of land degradation and restoration.
Marieke Sassen	Ch.3		391		392	Rephrase so it is clear that the drivers listed here and the five high level drivers and not the multiple indirect drivers.	Change accepted, rephrased
Cantele, Matthew	Ch. 3	14	393			It may be worth noting that indirect drivers themselves can also be impacted by direct drivers through nature's benefits given a long enough time horizon	Agreed. The two-way interaction between indirect and direct drivers is addressed both in the introduction and in treatment of synergies

						<p>The complex system approach to socio-ecological systems is underlying here. Yet some recent references do address these issues, with implications for the plausible futures and pathways. See the epistemological debate on the Anthropocene, e.g. Bai X., van der Leeuw S., O'Brien K., Berkhout F., Biermann F., Brondizio E.S., Cudennec C., Dearing J., Duraiappah A., Glaser M., Revkin A., Steffen W., Syvitski J., 2016. Plausible and desirable futures in the Anthropocene: A new research agenda. <i>Global Environmental Change</i>, 39, 351-362, http://dx.doi.org/10.1016/j.gloenvcha.2015.09.017</p> <p>Brondizio E.S., O'Brien K., Bai X., Biermann F., Steffen W., Berkhout F., Cudennec C., Lemos M.C., Wolfe A., Palma-Oliveira J., Chen A. C-T., 2016. Re-conceptualizing the Anthropocene: A call for collaboration. <i>Global Environmental Change</i>, 39, 318-327, http://dx.doi.org/10.1016/j.gloenvcha.2016.02.006</p> <p>See also more disciplinary agenda setting papers, e.g. in hydrology : McMillan H. Montanari A. Cudennec C., Savenije H., Kreibich H., Krueger T., Liu J., Meija A., van Loon A., Aksoy H., Di Baldassarre, G., Huang Y., Mazvimavi D., Rogger M., Sivakumar B., Bibikova T. Castellarin A., Chen Y., Finger D., Gelfan A., Hannah D., Hoekstra A., Li H., Maskey S., Mathevet T., Mijic A., Acuña A., Polo M., Rosales S., Smith P., Viglione A., Srinivasan V., Toth E., van Nooijen R., Xia J., 2016. <i>Panta Rhei 2013-2015: Global perspectives on hydrology, society and change</i>. <i>Hydrological Sciences Journal</i>, 61, 7, 1174-1191, http://dx.doi.org/10.1080/02626667.2016.1159308.</p>	This high level framing of issues is addressed in the introduction to the LDRA, not in Chapter 3.
Christophe CUDENNEC	Ch.3	14	393	21	577		
Zhao Gengxing	Ch.3	15	403	15	403	"3.3.2.1. Multiple, interacting drivers". Here it is the emergent characteristic rather than classification of drivers, so the word "drivers" should be deleted.	Change accepted and sub-titles rephrased into statements about properties of drivers
Marieke Sassen	Ch.3	15	406	15	412	Perhaps stick to the practical terms here (line 409-410) for ease of reading. INUS is not often used in this field as far as I know.	Change accepted, reference to INUS removed
Marieke Sassen			411		411	Box 3.2 is mis-labelled and should be Box 3.3 (p20).	Corrected
Marieke Sassen	Ch.3	15	426	15	444	Move to next section? Looks like context dependent driver to me	Treatment of natural env variability has been left as it focuses on interactions between natural and anthropogenic factors
Gunay Erpul	Ch.3	15	427	15	430	This sentence is long and uneasy to perceive, also check the verb of when clause.	Re-written
Cristobal Diaz	Ch 3	15	432	15	432	You would to explain to what you refer with word <u>elevation</u> I can think that is altitude , but would be more explained.	The whole sentence was revised to make it easier to understand.
Steve Prince	Ch. 3		436		436	...see also Ch 4 sect 4.2.6.2.4, and a case...	Change accepted
Zhao Gengxing	Ch.3	16	445	16	445	"3.3.2.2. Context dependent drivers" should delete "drivers"	Change accepted
Cristobal Diaz	Ch 3	16	449	16	450	In the part : "economically developed countries of Latin America and SE Asia compared to many less developed countries in Africa...." I think that is better to write"economically <u>more</u> developed countries of Latin America ...", because developed countries is a United Nations category.	It's a comparative sentence (developed vs less developed). We believe this sentence is clear as is.
Katalin Török	Ch.3	16	461		462	citation format	Citation formatting was finalized in final rendition of the text
Cantele, Matthew	Ch. 3	16	463			Access to markets can also incentivize bushmeat harvesting beyond personal consumption	Reference to bushmeat here is just provided as an example
Marieke Sassen	Ch.3	16	477	16	480	from "Working in...". Cut sentence in two. "in expectation of resource use theory" seems out of place.	Change accepted
Cantele, Matthew	Ch. 3	16	484			This statement is no doubt true but rather ambiguous in its current formulation	Change accepted, rephrased
Shenggong Li	Ch.3	16	487	70	2334	Cited literature format is not consistent throughout the context	Citation formatting was finalized in final rendition of the text
Katalin Török	Ch.3	16	487			citation format	Citation formatting was finalized in final rendition of the text
Shihai LV	Ch.3	17	488	42	1323	Check all the figures, revise some of "Fig. " to "Figure" in figure caption; revise the big letter "A, B, C..." in figure to small letter "a,b,c...". In addition, unify the citation "Figure. xx" in text instead of some "Fig. xx".	Figure citations all standardized in final version of the chapter
Marieke Sassen	Ch.3	17	506	17	507	Provide some detail on method and data underlying these figures?	More detail added
Germany	Ch.3	17	506			This Figure has a low resolution quality. Please improve.	Citation formatting was finalized in final rendition of the text
Eila Gendig	Ch. 3	17	506			Are there case studies of small Pacific Island nations that could be included in the diagram?	This analysis is based on a published meta-analysis which cannot be updated
Zhao Gengxing	Ch.3	18	509	18	509	"3.3.2.3. Non-linear, rapidly changing drivers" should delete "drivers"	Change accepted, rephrased
Cantele, Matthew	Ch. 3	18	510			Are you referring to drivers in general here rather than "indirect drivers"?	Indirect drivers, as stated in the sentence
Germany	Ch.3	18	521			Please correct number of Box: Box 3.2	Corrected
Cantele, Matthew	Ch. 3	18	521			Perhaps we can cross-reference to the ECA deliverable on Central Asia. The scenarios chapter has several Central Asia case studies.	Relevance of comment on Central Asia to text is not clear
Gunay Erpul	Ch.3	18	521	13	522	Box 3rd Paragraph - Detrimental waterlogging effects on soil ecosystem services within plan root zone (insufficient oxygen in the pore space, carbon dioxide and ethylene accumulation, (contaminants (mobility of toxic elements (arsenic)), highest N2O emissions,	Extra detail not included due to space restrictions. Detrimental effects of water logging are clear

Gunay Erpul	Ch.3	18	521	13	522	Salinization is also challenging in some areas in Spain, Hungary, Turkey, and Russia as it is a widespread threat in Central Asia.	Extra detail and examples not included due to space restrictions.
Gunay Erpul	Ch.3	18	521	13	522	Along with inadequate irrigation technology and water quality, land use changes also promote salinization.	Extra detail and examples not included due to space restrictions.
Marieke Sassen	Ch.3	18	521	18	522	"Box 3.1." Should be Box 3.2. (Box 3.1. is on p9). And, line 2 "proximate". This is Lambin language, which is not used in the rest of the chapter. I would use "direct driver" as this is what has been used in this chapter to mean the same. There seems to be no reference to this Box anywhere (apart from the misnumbered ones). It seems to fit with 3.3.2.1., but it is a bit of an odd combination of theory and examples...	Term proximate driver is no longer used, in favour of direct driver, and Box 3.3 (as now numbered) is cited in text.
Katalin Török	Ch.3	19	526			citation format	Citation formatting was finalized in final rendition of the text
Marieke Sassen	Ch.3	19	528	19	528	Box 3.2. should be 3.3. The first 2 paragraphs are indeed about drivers of forest transitions. The others not. Should they be in a different Box?	Change accepted, last two paragraphs moved out of box into main text
Steve Prince	Ch. 3		549		551	Note the conceptual diagram in Ch 4 , fig 4.3, which makes some of these points. I can also offer a more decorative version of this ball-and-valley model on request to Steve Prince.	Figure retained for simplicity and consistency in treatment of concepts between chapters
Cantele, Matthew	Ch. 3	19	558			Telecoupling as a concept is not always clear even for specialists - I would provide additional context or refer to a definition	Change accepted, rephrased as linkages
Finnish Government	Ch. 3	20	561	20	567	Sentences repeat the lines 386-392	Repetition removed
Marieke Sassen	Ch.3	20	562	20	567	This whole paragraph is the same as line 386 to 392. I would delete from here.	Repetition removed
Eila Gendig	Ch. 3	20	564		567	Typology already covered on page 13	Repetition removed
Cristobal Diaz	Ch 3	20	564	20	567	"At the highest level Lambin et al. (2003) propose a typology of five high-level causes of land use change, and hence associated land degradation and restoration processes, each of which may be underpinned by multiple indirect drivers: resource scarcity, market opportunities, external policy intervention, loss of adaptive capacity and changes in social organization." This idea is the same reflected in page 14 lines 389-392. I propose to place in only one place	Repetition removed
Germany	Ch.3	20	567			Please correct number of Box: Box 3.3	Corrected
Finnish Government	Ch. 3	20	567	20	568	Box 2nd Line "natural recovery" instead of "natural regeneration", which is a forest management practice	Change accepted
Katalin Török	Ch.3	20	567	20	568	missing from literature: Mather 1992	Citation formatting was finalized in final rendition of the text
Katalin Török	Ch.3	20	567	20	568	citation format: Green, Cornell, Scharlemann, & Balmford, 2005	Citation formatting was finalized in final rendition of the text
Germany	Ch.3	21	570			This Figure has a low resolution quality. Please improve.	The resolution of the Figure is improved on final copy
EL Khitma EL Awad	Ch. 3	22	579	23	636	need to be brief and simple for easy understanding	Change accepted, rephrased for simplicity
Cantele, Matthew	Ch. 3	22	579	22	601	This debate on the relative role of demographic growth and consumption is very much alive. Obersteiner et al. 2016 SDG paper concludes that policy siloes have a larger causal role in terms of environmental impacts than current demographic scenarios (SSPs)	Conclusions of Obersteiner et al. 2016 now included
Shenggong Li	Ch.3	22	583	22	583	"neither population or poverty alone"-->"neither population nor poverty alone"	Change accepted
Katalin Török	Ch.3	22	600			citation format	Citation formatting was finalized in final rendition of the text
Katalin Török	Ch.3	22	605		607	citation format	Citation formatting was finalized in final rendition of the text
Marieke Sassen	Ch.3	22	615	22	619	From "Moreover...". This was established already (the fact that multiple factors drive LDR). I would delete this.	Change accepted, rephrased
Katalin Török	Ch.3	22	615			citation format	Citation formatting was finalized in final rendition of the text
Katalin Török	Ch.3	22	621			wording	Change accepted
Katalin Török	Ch.3	23	623		624	citation format	Citation formatting was finalized in final rendition of the text
Cantele, Matthew	Ch. 3	23	628			Perhaps some of the ILUC literature (e.g., Havlik et al...) would be relevant here	Additional background on ILUC is not included due to space restrictions
Virginia Meléndez Ramírez	3	23	637	23	637	Another example is the companies of transgenics that request permission to plant them in other countries	This detail on transgenic companies is not included due to space restrictions
Marieke Sassen	Ch.3	23	658	23	658	Delete the word "resource"	Change accepted
Steve Prince	Ch. 3		662		664	See recent paper from our Dept.: van Vliet, J., Eitelberg, D. A., & Verburg, P. H. (2017). A global analysis of land take in cropland areas and production displacement from urbanization. <i>Global Environmental Change</i> , 43, 107–115. http://doi.org/10.1016/j.gloenvcha.2017.02.001	van Vliet et al. (2017) reference is now included in section 3.3.6 on infrastructure
Shenggong Li	Ch.3	24	671	24	671	" a countries use of "-->" a country use of "	Change accepted
Katalin Török	Ch.3	24	692			citation format	Change accepted
Marieke Sassen	Ch.3	25	693	25	694	Add a bit more detail on how this happened	Change accepted

Katalin Török	Ch.3	25	712	713		citation format	Change accepted
Steve Prince	Ch. 3	Sect 3.4 , 737	737			Significant duplications with Ch 4 on many topics throughout this section. The LDRA Scoping assigned the processes of degradation to Ch.3 and their status and trends to Ch.4. There is a lot of excellent material here on status and trends, so solutions are: 1. ignore the Scoping structure and leave Ch 3 as is, with appropriate citations to/from Ch. 4 (e.g. Ch 4, line 2703). 2. Transfer the material relevant to Ch. 4 and merge. Notwithstanding, it would be necessary for Ch. 3 to mention, but not elaborate, on status in order to indicate why a process is important. What to do?	All boundaries between Chapter 3 and Chapter 4 were worked out at the authors meeting in Rome.
Marieke Sassen	Ch.3	Section 3.4	737	Section 3.4		Revise allocation of information among level 4 sub-sections in section 3.4 and the subsection titles to reflect the content. Especially the first subsection of each driver section called "Changes..." but then subsection 3 is about "Past, present and future...", so also about change. This is confusing. Only Section 3.4.6. uses more logical titling. Perhaps use as an example? Also the split among drivers in section 3.4.2.2 could be considered for all sections?	All boundaries between Chapter 3 and Chapter 4 were worked out at the authors meeting in Rome. This also helped to streamline and simplify the subsection titles. We now have only 2 sub-headings per each subsection.
Marieke Sassen	Ch.3	26	738	26	738	Not all in this list are drivers. At least they are not formulated as drivers. See earlier comment on this at Line 311	Thank you, your comment was valid and we reformulated accordingly so each of the 8 drivers read as a drive. For example grazing lands now reads "management of grazing land" to reflect the original meaning behind it.
Cristobal Diaz	Ch 3	26	749	31	938	The point - " 3.4.1 Grazing land management " is very large and over-explained, I suggest to short.	I believe this is in response to the opening section. The opening section defining grazing land management was reduced by ~ 80 words.
Steve Prince	Ch. 3		755		779	Need to agree on these figures with Ch 4. For example Ch 4 lines 2672-3 has 25% of the land surface or over 50% of agricultural land and 69% of drylands is used for grazing (Asner et al. 2004, Reid et al 2004).	Chapter 4 shared this text with Chapter 3 after the authors meeting in Rome. Text is now in agreement.
Katalin Török	Ch.3	26	768			citation: Reid, Galvin, & Kruska, 2008	Reference has been formatted
Shenggong Li	Ch.3	26	776	26	776	"are become"-->"are becoming"	Change made
Katalin Török	Ch.3	26	776			citation: Reid, Galvin, & Kruska, 2009	This reference is Reid et al. 2008. I believe the comment was related to formatting of the reference. See line 295 above.
Katalin Török	Ch.3	27	788			Schneider et al missing from the literature	Reference removed. We were unable to find it.
Marieke Sassen	Ch.3	27	793		793	Increasing demand in general has led to extensification I would say, not just the competing demands	Text changed to "increasing demands" from "competing demands."
Marieke Sassen	Ch.3	27	804	27	808	This is more of a potential future mitigating driver. Move to section 3.4.1.3?	The paragraph was edited to reflect changes in diet and animal product consumption during the time period from 2000-2010.
Marieke Sassen	Ch.3	27	804	27	804	Repeated with line 809 and line 813	The sentence in 813 has been removed to reduce repetition
Shenggong Li	Ch.3	27	805	27	805	"in in"-->"in"	Change made
Katalin Török	Ch.3	27	805			wording	This sentence has been edited for clarity
Cantele, Matthew	Ch. 3	27	811			Contrast with India where sociocultural norms on meat consumption	Information on India was added to contrast that even with income growth no change in diet has been observed due to strong sociocultural norms
Marieke Sassen	Ch.3	27	816	27	816	Needs a reference	Reference for food waste and overeating has been added
Finnish Government	Ch. 3	27	817	28	829	A bit confusing paragraph. What is the point? The inverted U-shaped Kuznets curve challenges what is said in lines 123-124 ? But little evidence that the curve would fit in biodiversity context?	All references to the Kuznets curve has been deleted.
Marieke Sassen	Ch.3	27	817	27	818	Surely this only happens if the policy objectives are bad ones? (the sentence implies a negative effect, perhaps reformulate to more neutral)	This sentence has been edited for a more neutral tone on policy objectives
David Le Maitre	Ch.3	28	817	29	829	Kuznet's curve hypothesis is controversial and strongly disputed, especially the notion that there truly is recovery in the sense of restoration rather than rehabilitation. For example Europe's loss of environmental diversity as a result of industrial and economic development has arguably been irreversible, especially in terms of the (megafauna). I suggest you avoid reference to Kuznets.	All references to the Kuznets curve has been deleted.
Katalin Török	Ch.3	27	818			which in turn drive the severity	This sentence has been changed to reflect a more neutral tone on policy objectives.
Marieke Sassen	Ch.3	27	820	27	820	Explain how this leads to degradation (or restoration?)	These sentences were related to the Kuznets curve and were removed due to the controversial nature and general lack of support for these dynamics in conservation of biodiversity.
Marieke Sassen	Ch.3	27	823	28	829	Some overlap with 3rd paragraph in Box 3.3, p20.	Text on the Kuznets curve has been removed from this section and there is no longer overlap with the indirect drivers section.

David Le Maitre	Ch.3	29	830	29	849	There are many similar examples in Africa where the driver has not been privatisation (although that is involved in some recent examples of land colonisation by foreign countries) but a breakdown of social systems (leading to uncontrolled access and rent seeking), often linked to a wider breakdown of formal governance due to corruption. There are some cases where this process has been successfully reversed such as the Fireside programme in Zimbabwe which was successful for several years, and the "Meat Naturally" programme launched in South Africa (http://www.conservation.org/publications/Documents/CI_South-Africa_CSA_Meat-Naturally-Sustainable-Farming_Factsheet.pdf) and similar initiatives for natural products in Tanzania and other African countries	These are all good example but due to lack of space in this section we are unable to include more. We did, however, expand on the Mongolia example and discussed the community based grassland conservation project that was created in response to widespread degradation.
Finnish Government	Ch. 3	28	833	28	834	should there be words "to maintain" ? Prevent overstocking and "to maintain" the capacity of the land to provide...	Change was made and "to maintain" was added to the sentence
Marieke Sassen	Ch.3	28	838	28	840	Bit clumsy sentence	Sentence was edited for clarity
Marieke Sassen	Ch.3	28	838	28	847	Put in a Box as an illustration?	We have not gone into enough detail in this example to warrant a box.
Katalin Török	Ch.3	28	841			Jiang, Han & Wu 2006; Tayles 2006 missing from the Litr.	Jiang et al. 2006 was added. Tayles was missing and we were unable to locate the reference.
Marieke Sassen	Ch.3	28	849	28	849	Needs references or referring to a section of the chapter where this underlying driver is discussed in more detail. It is an important topic.	Reference to Leisher et al. 2012 added
Katalin Török	Ch.3	28	851	28	854	Herrero citation format	Now formatted correctly
Marieke Sassen	Ch.3	28	859	28	859	and potentially on animal welfare	Animal welfare added to the list of negative consequences of intensification of livestock production
Marieke Sassen	Ch.3	28	861	28	862	"clearly": please explain. From figure 3.5 and the text below, the increase in demand for grazing lands is not that clear. There have been obvious trend changes over time.	This section has been completely revised and a different data set is now used to describe changes in grazing lands.
Marieke Sassen	Ch.3	28	862	28	867	This whole section needs clarification and linking the different trend periods with the drivers that may have caused these trends, and the switch from down to up and vice versa.	This section has been completely revised and a different data set is now used to describe changes in grazing lands.
Steve Prince	Ch. 3		862		869	Status and trend (therefore Ch 4)?	In the Third Authors Meeting in Rome we discussed the chapter boundaries. We are reporting here on the Status and Trends of the direct driver and not the status and trend in biodiversity, ecosystem function and services.
Katalin Török	Ch.3	28	863			Schneider et al. missing from the literature	Schneider 2015 replaced by Alexander et al. 2015
Marieke Sassen	Ch.3	28	864	28	864	It says here grazing land increased modestly by 1%, but this modest amount still represents 45 million ha, which is not a modest amount in itself (e.g. getting close to the size of Spain). The figure 3.5 makes the changes look a lot more dramatic, and in my mind gives a better picture than the text.	This section has been completely revised and a different data set is now used to describe changes in grazing lands.
Marieke Sassen	Ch.3	28	865	28	867	Downward decline = both going down. One is enough. Use "downward trend" or "decline"	This section has been completely revised and a different data set is now used to describe changes in grazing lands.
Marieke Sassen	Ch.3	28	865	28	865	"Interestingly": why is this interesting? And any idea why this decline happened?	This section has been completely revised and a different data set is now used to describe changes in grazing lands.
Marieke Sassen	Ch.3	28	867	28	867	No, actually, the most recent data suggest there may be a small increase again after 2008 (Fig 3.5 a)). Which may be a reason the model predictions are consistent because they may be using some of this data, and the underlying drivers (which are??) too.	This section has been completely revised and a different data set is now used to describe changes in grazing lands. We now report animal density across 20 subregions globally in 2000 and 2009.
Katalin Török	Ch.3	28	868		869	citation format	Citation formatted correctly
Steve Prince	Ch. 3		878		898	Status and trends, therefore Ch 4?	In the Third Authors Meeting in Rome we discussed the chapter boundaries. We are reporting here on the Status and Trends of the direct driver and not the status and trend in biodiversity, ecosystem function and services.
Marieke Sassen	Ch.3	29	880	29	883	Ruminant numbers: why not have a graph to show these trends in figure 3.5? "This region"= Africa, Asia or both?	This section has been completely revised and a different data set is now used to describe changes in grazing lands. We now report animal density across 20 subregions globally in 2000 and 2009.
Eila Gendig	Ch. 3	29	881		885	Can you please clarify whether statements on stocking densities and stock numbers are averaged across a region? At a smaller spatial scale, changes in stocking regimes (e.g. extensive sheep farming to intensive dairying) may have lead to a decrease in numbers but an increase in impacts on land and soil.+	This section has been completely revised and a different data set is now used to describe changes in grazing lands. We now report animal density across 20 subregions globally in 2000 and 2009.

Marieke Sassen	Ch.3	29	881	29	882	How modest? It would be good to add the regional trends to Figure 3.5 a). See also comment on line 864	This section has been completely revised and a different data set is now used to describe changes in grazing lands. We now report animal density across 20 subregions globally in 2000 and 2009.
Marieke Sassen	Ch.3	29	883	29	883	"this region": which region?	This section has been completely revised and a different data set is now used to describe changes in grazing lands. We now report animal density across 20 subregions globally in 2000 and 2009.
Marieke Sassen		29	885	29	885	Fig 3.5 does not show livestock numbers, just density. Add a figure with numbers	We report density to illustrate as a pressure on the land. Livestock numbers provide very little information unless it is expressed per unit of agricultural land area. We now report ruminantns (cattle and buffalo) and in this revision we have added sheep and goat densities.
Marieke Sassen	Ch.3	29	886	29	890	Bit odd transition to the added effect of CC.	This section has been revised and the role of climate in understanding resilience of grazing lands to grazing is now a separate paragraph.
Katalin Török	Ch.3	29	888			citation format	Citation now formatted correctly
Katalin Török	Ch.3	29	889		890	wording	This section has been completely revised.
Katalin Török	Ch.3	29	898			Briske et al. 2008 missing from the Litr.	The section on restoration has now moved to another chapter. If the text is used then Briske et al. 2008 will be included in the citations.
David Le Maitre	Ch.3	29	910	30	917	A similar shift has occurred in South Africa with increasing use of Nguni cattle which are much hardier than European races but still produce quality meat.	Thank you for this reference. The information on breeds has now been passed to other chapters. With space limitations we may only have the opportunity to highlight one example.
Steve Prince	Ch. 3		913		913	Cross breeding with Afrikaner cattle in South Africa, also the introduction of Tuli traditional breeds from Botswana and Zimbabwe to eastern South Africa. http://www.ansi.okstate.edu/breeds/cattle/tuli	Thank you for this reference. The information on breeds has now been passed to other chapters. With space limitations we may only have the opportunity to highlight one example.
Marieke Sassen	Ch.3	30	915	30	915	So they mix the Criollo with other breeds? Earlier it says they are introduced as an alternative (L912)	The use of criollo has been limited to mostly research populations. At this time they were introduced as pure breeds but there are now ranches that are breeding Criollos with other breeds.
David Le Maitre	Ch.3	30	920			more should be increase	The section on restoration has now moved to another chapter.
Germany	Ch.3	30	921	30	922	As you also suggest the use of "non-natives species" to reduce soil erosion, in this case you may be suggesting 'rehabilitation' rather than 'restoration'? Please cross-check this para against the definitions provided in the previous chapters.	The section on restoration has now moved to another chapter (Ch6). The clarification on rehabilitation vs restoration has been made accordingly.
Katalin Török	Ch.3	30	923			citation different from 917, the same literature, please correct	The section on restoration has now moved to another chapter. Citation was corrected in the retained text (in Ch6)
Katalin Török	Ch.3	30	926		928	Please explain water pollution through the use of synthetic fertilizers, add litr.	The section on restoration has now moved to another chapter. If the text is used we will make sure that the correction is made. See Chapter 4, Section 4.2.4.3
Zhao Gengxing	Ch.3	31	929	31	932	The title of Figure 3.5 should be put below the figure	We inserted the title below the revised figure.
Steve Prince	Ch. 3		929		930	Isn't this a trend issue, belonging in Ch 4?	These are trends in drivers and not in land degradation. Thus it should be in Chapter 3.
Steve Prince	Ch. 3		932		932	Cite source	Source data is now cited for revised figure
Marieke Sassen	Ch.3	31	933	31	933	3.5 a) Add split per region?	Grazing land area has now been split into 20 subregions
Marieke Sassen	Ch.3	31	935	31	935	Fig 3.5 b) does not really convey much with it's flat curves. Please consider changing the scale/show Oceania separately	This section has been completely revised and a different data set is now used to describe changes in grazing lands and animal numbers. We now report animal density across 20 subregions globally in 2000 and 2009.
Germany	Ch.3	31	935			It is difficult to differentiate the blue colours used for Oceania and for Africa. Try using another colour to improve readability of the Figure.	This section has been completely revised and a different data set is now used to describe changes in grazing lands and animal numbers. We now report these numbers in a table.
Steve Prince	Ch. 3	Sect. 3.4.2. line 939 -	939			In order to accommodate Ch 3's (human) drivers, Ch. 4 maintained the original Ch 3 divisions. Clarity could be served by splitting the topics here.	I believe that Chapter 3 and Chapter 4 are now aligned after the 3rd author meeting.
Virginia Meléndez Ramírez	3	32	941	32	941	Is there more recent data?	FAO statistics of the most recent year of data has been cited .
Katalin Török	Ch.3	32	956			Pay et al missing from the Litr	This reference (which is actually Ray, not Pay) was added to the bibliography
Marieke Sassen	Ch.3	32	959	32	960	Loose statement. Obviously it does but the statement begs the question: How? Which might be described in another chapter.	The sentence was removed

Marieke Sassen	Ch.3	32	967	32	979	Section needs editing for flow	OK done.
Katalin Török	Ch.3	32	968		969	citation format	All citation formats have been changed for the final draft
Marieke Sassen	Ch.3	32	977	32	977	Why "indeed?"	Sentence was moved up so that the "indeed" makes more sense.
Katalin Török	Ch.3	32	978		979	citation formats	All citation formats have been changed for the final draft
Katalin Török	Ch.3	32	981		982	citation formats	All citation formats have been changed for the final draft
Marieke Sassen	Ch.3	33	985	33	985		All citation formats have been changed for the final draft
Virginia Meléndez Ramírez	3	33	988	33	993	Explain that these are monocultures and their implications.	A part of sentence added to clarify that these are often intensive cultures with environmental implications.
Cantele, Matthew	Ch. 3	33	988	33	1000	These 2 sections seem underdeveloped. Future scenarios of energy crop production under climate change mitigation scenarios entail massive increases in cultivated areas. See the bioenergy section in chapter 7	A sentence was added on this in reference to Boysen et al. 2017 Earth's Future and Chapter 7.
Marieke Sassen	Ch.3	33	989	33	990	A small area of what? (demand is not an area) Put date (2011) in text not in brackets	Revised.
Marieke Sassen	Ch.3	33	991	33	991	In what way have they become a high priority issue? How is this expressed? Regulation on % biofuel in fuels? Taxes? Subsidies? For local production or international trade? Etc. These are all underlying drivers of change	This has been clarified.
Finnish Government	Ch. 3	33	992	33	992	help to reduce increase in CO2 emissions	Revised as "helping to mitigate".
Katalin Török	Ch.3	33	993			Birur, Hertel & Tyner 2008 Missing from Litr	Reference was added
Katalin Török	Ch.3	33	998		993	The part on biofuels is rather short, addition on the impacts on biodiversity could enhance the content (e.g.: Immerzeel, D. J., Verweij, P. I. T. A., Hilst, F. L. O. O. R., & Faaij, A. P. (2014). Biodiversity impacts of bioenergy crop production: a state-of-the-art review. Gcb Bioenergy, 6(3), 183-209.; Joly, Carlos A., et al. "Biofuel impacts on biodiversity and ecosystem services." Scientific Committee on problems of the environment (SCOPE) rapid assessment process on bioenergy and sustainability (2015): 555-580.)	The part on biofuels was expanded based on these two references as well as Boysen et al. 2017, and referring to Chapter 7.
Virginia Meléndez Ramírez	3	33	1001	33	1007	You could put an example.	Considering space limitations developing a proper example seems difficult here, but some examples were cited in the part about new crops that spread with culturally changing demands.
Suneetha Mazhenchery Subramanian	Ch. 3	33	1004			see also https://www.cbd.int/doc/publications/cbd-ts-52-en.pdf Bélaïr C., Ichikawa K., Wong B.Y. L., and Mulongoy K.J. (Editors) (2010). Sustainable use of biological diversity in socio-ecological production landscapes. Background to the 'Satoyama Initiative for the benefit of biodiversity and human well-being.' Secretariat of the Convention on Biological Diversity, Montreal. Technical Series no. 52, 184 pages.	A sentence was added on this based on this reference.
Marieke Sassen	Ch.3	33	1004	33	1007	Needs a bit more spelling out of how this affects extent and management, e.g. what types of changing urban-rural interaction? Any information on croplands? (now only agroforestry)	This was developed to include a reference to spreading innovations or growth of certain crops that fulfill emerging culturally-driven urban demands
Katalin Török	Ch.3	33	1004			citation format	All citation formats have been changed for the final draft
Cantele, Matthew	Ch. 3	33	1008			Given the scope of this chapter and extensive overview of future scenarios in Chapter 7, perhaps it is unnecessary to cover the future here or some sections could be moved	We have developed the chapters in a way that has some overlap and hand offs to other chapters. For example the "future" in croplands is a nice compliment to the "food" scenario in Chapter 7.
Zhao Gengxing	Ch.3	33	1008	36	1106	This section should be more examples of cropland management, such as irrigation and soil management.	This section now includes more information regarding irrigation and other types of management
Katalin Török	Ch.3	33	1009			Ellit et al missing from littr	This reference has been added to the bibliography
Nathalie van Haren	Ch.3	33	1013	35	1047	This paragraph is about fertilizer use, while the introduction to the paragraph talks about "Global fertilizer use and pesticide production increased linearly between 1960-2000" (line 1013). Please be consistent	It is difficult to say much more about pesticide use because there is much more data and knowledge of fertilizer use than of pesticide use.
Astrid Hilgers	Ch.3	33	1013	35	1047	This paragraph is about fertilizer use, while the introduction to the paragraph talks about "Global fertilizer use and pesticide production increased linearly between 1960-2000" (line 1013). Please be consistent	It is difficult to say much more about pesticide use because there is much more data and knowledge of fertilizer use than of pesticide use.
UNCCD SPI	Ch.3	33	1013	35	1047	This paragraph is about fertilizer use, while the introduction to the paragraph talks about "Global fertilizer use and pesticide production increased linearly between 1960-2000" (line 1013). Please be consistent	It is difficult to say much more about pesticide use because there is much more data and knowledge of fertilizer use than of pesticide use.
Eila Gendig	Ch. 3	33	1018	34	1029	Fertiliser efficiency has been mentioned earlier in the chapter	The final draft has been streamlined to avoid unnecessary overlaps and repetitions

NFP of China	chapter 3	33	1022	33	1024	There is no need to emphasize China, we recommend to delete "including China"	Sentence replaced more general statement "In contrast, many countries in the Asia and the Pacific regions, have exhibited " and "Many African countries, have seen little" removing reference to China and Nigeria
EL Khitma EL Awad	Ch. 3	33	1023	33	1025	such as instead of including	Revised as suggested
Marieke Sassen	Ch.3	33	1025	33	1025	Why single out Nigeria?	Nigeria is one of four countries that are presented as examples for each of the four types of trends that have been previously identified. The purpose is not to single out Nigeria, but rather to show these four types of trends.
Virginia Meléndez Ramírez	3	34	1026	34	1029	Explain the enormous expenditure of water that these countries have and their consequences.	This section now includes more information regarding irrigation and other types of management
Shihai LV	Ch.3	34	1029	50	1630	Figures from 3.6 to 3.11 are not clear enough, should be revised.	Revised as suggested
Astrid Hilgers	Ch. 3	34	1032	34	1032	The figure depicts N output versus N input. Not clear is what is taken into account for N output (only food crops?) and what is taken into account for N input (only food crop or total fertilizer consumption, manure applications, etc.?). Without this info it is difficult to interpret the trends correctly.	Revised as suggested
Astrid Hilgers	Ch. 3	34	1032	34	1032	interesting paper on trends in NUE: http://www.nature.com/nature/journal/vaop/ncurrent/pdf/nature15743.pdf	Thank you for pointing us to this reference
Marieke Sassen	Ch.3	34	1032	34	1033	Need to include explanation of a), b), c) and d) in figure caption	Revised as suggested
Germany	Ch.3	34	1032			This Figure has a low resolution quality. Please improve.	Revised as suggested
Germany	Ch.3	34	1035	34	1035	Include a reference that explains the criteria used for delineating the IPBES regions and their locations.	Thank you. We have revised this section and the corresponding graph to which this comment pertains. We are now focusing on specific examples of 4 trends (not according to IPBES regions). We used the graphic supplied by IPBES Task Group on Indicators. And the explanation on IPBES regions can be found : https://www.ipbes.net/dataset/ipbes-regions-subregions
Marieke Sassen	Ch.3	35	1045	35	1047	Same comment as above	We revised as suggested per your earlier comment.
Germany	Ch.3	35	1045			This Figure has a low resolution quality. Please improve.	Revised as suggested
Eila Gendig	Ch. 3	35	1048			extensification and intensification simultaneously? Regional differences? Or difference based on primary crop species	Revised as suggested
Astrid Hilgers	Ch. 3	35	1048	35	1052	Alexandratos & Bruinsma projected +60% ("FAO estimate"). Together, they, viz. Tilman and FAO, seem to have captured the range of projected food demand increase towards 2050 (see also: http://onlinelibrary.wiley.com/doi/10.1111/agec.12089/abstract;jsessionid=7F57AF981CD4761249DA78C4A60AE5E8.f04t02).	Revised as suggested
Nathalie van Haren	Ch.3	35	1052	35	1052	In other chapters, pesticides are specified by herbicides, pesticides and fungicides	Herbicides and fungicides are typically described as pesticides in the agronomy literature, which is what we are citing in this section.
UNCCD SPI	Ch.3	35	1052	35	1052	In other chapters, pesticides are specified by herbicides, pesticides and fungicides	Agreed, we use the broad term "pesticide" in this sentence to denote the use of anything that kills a pest which includes weeds, insects, and fungal pathogens.
Astrid Hilgers	Ch. 3	35	1054	35	1057	Does this include the possibility that one ha in tropical regions may be used for two or three crops per year and that may yield more than one crop in a temperate region (instead of only 50%?	Yes, this accounts for multiple harvests. This has now been clarified in the text.
Marieke Sassen	Ch.3	35	1056	35	1058	Please clarify, carbon loss will be 2 times higher than? And why?	Revised as suggested
Katalin Török	Ch.3	35	1057			West et al missing from litr	Revised as suggested
Marieke Sassen	Ch.3	35	1058	35	1061	Move lower down in text. Perhaps before line 1087?	To avoid confusion, this text has not been moved as suggested
Marieke Sassen	Ch.3	35	1058	35	1058	Not just deforestation but any land conversion	Revised as suggested

Sandhya Chandrasekharan	Ch.3	35	1060	35	1061	It would be more policy-relevant for the document to discuss if possible what exactly could be the benefits from shifting diets and reducing food waste by quantifying and depicting what is already known about how much is being wasted and the ecological footprints of diets - country report cards maybe?	Thank you. It is indeed an important topic and the benefits of shifting diets have been discussed in Ch7. It is not within the scoping of Ch3 to discuss this here. It has also become one of the key messages in the summary for policy makers.
Astrid Hilgers	Ch. 3	35	1061	35	1061	Also improving feed use efficiency in livestock production may reduce land requirement. Earlier it was stated that 35% of crop land is used for livestock feeding: it is even more if you take the byproducts, such as crop residues and cake from oilcrops, into account. The nitrogen harvested from cropland used for vegetal food items is only 1/3 of total N yield from cropland (see paper in press: "Can our global food system meet food demand within planetary boundaries?", Conijn et al, 2017, Agriculture, Ecosystems and Environment).	Revised as suggested
Gunay Erpul	Ch.3	35	1062	35	1071	Soil organic carbon (SOC) and soil biodiversity interacted with increases in food availability, restoration of productivity in degraded soils, and the resilience of food production systems.	We were unable to add text on this topic, due to space constraints.
Katalin Török	Ch.3	35	1065			Friedlingstein et al. 2010 missing from liter	Revised as suggested
Astrid Hilgers	Ch. 3	35	1069	35	1069	Unclear why N2O emission is mentioned here for several reasons: (1) it is not the main GHG from agriculture and (2) without N fertilizer and with current food demand we would need much more land with its associated GHG emissions due to clearing more natural land. Smith, P. et al., 2014. Agriculture, Forestry and Other Land Use (AFOLU), in: Edenhofer, O. et al. (Ed.), Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom. Tilman, D., Balzer, C., Hill, J., Befort, B.L., 2011. Global food demand and the sustainable intensification of agriculture. Proceedings of the National Academy of Sciences of the United States of America 108, 20260-20264.	We did not remove this connection between the intensification of agriculture and climate change. We already mentioned above the larger contribution of land conversion to carbon emissions, which acknowledged the climate-related costs of intensification. These N2O emissions are secondary but do contribute substantially to climate change. Removing this content would present a biased promotion of the land sparing strategy, without acknowledging these associated costs of intensification.
Katalin Török	Ch.3	35	1069			Isbell et al missing from liter	Revised as suggested
Katalin Török	Ch.3	35	1071			Compton et al. 2011; Sutton et al. 2011: missing from the liter	Revised as suggested
Marieke Sassen	Ch.3	35	1072	35	1072	Further? To what? Restoration has not yet been discussed	Amended to read "Extensive restoration ...
Marieke Sassen	Ch.3	35	1073	35	1073	Why unlikely?	Amended to read "...as these areas are expected to continue to produce much needed commodities."
Marieke Sassen	Ch.3	35	1074	35	1074	"Expectations" = "objectives"? Specify that this is Aichi target 15 under the CBD in the text	Amended as suggested
Marieke Sassen	Ch.3	35	1074	35	1076	So how do these two targets relate?	amended to read "... next 5 years through the Convention on Biological Diversity (i.e. by 2020; http://www.cbd.int/sp/targets/ : Target 15) while the 2011 International Union for Conservation of Nature Bonn Challenge..."
Germany	Ch.3	35	1076	35	1076	The Bonn Challenge aims to restore 150M ha by 2020 and 350 Mha by 2030 (www.bonnchallenge.org).	Amended as suggested
Steve Prince	Ch. 3		1079		1080	Much of this is assigned in the Scoping to other chapters. Little is on human drivers and processes. Much belongs in Ch2, 4, 5 and 6. e.g Ch. 2 (e.g. 1773-87, 1913-8) has some relevant text on this. At least could be cited.	Chapter boundaries for the FGD were clarified in the Rome meeting in July 2017
Germany	Ch.3	36	1084	36	1086	Please include a reference on the outcomes of the IPBES Assessment on "Pollinators, pollination and food production".	Reference included
Katalin Török	Ch.3	36	1084			Tscharntke et al. 2012 missing from liter	Reference included
Sandhya Chandrasekharan	Ch.3	36	1087	36	1088	very important point to make. Connects to above	Thank you.
Marieke Sassen	Ch.3	36	1087	36	1087	Why also? Clarify why arguments are challenging. Perhaps reformulate	Amended to read "Current global food production is sufficient to feed the world but is inequitably distributed and unaffordable to many people, challenging suggestions that ongoing agricultural intensification is necessary."
David Le Maitre	Ch.3	36	1087	36	1099	I am surprised that you do not mention the work that shows that small farms, often with multiple crops grown at the same time, and sometimes mixed, can be more productive than high-input intensive farming. The FAO has a report on this topic which certainly suggests a way of improving land productivity and feeding more people that is less energy intensive and promotes biodiversity and its benefits, including resilience.	discussion is about restoration not sustainable farming

Katalin Török	Ch.3	36	1091			(Kremen & M'Gonigle 2015; M'Gonigle et al. 2015 missing from the Litr	Reference incded.
Marieke Sassen	Ch.3	36	1095	36	1096	"But while socio-economic issues are important". This sounds like these were just discussed whilst they aren't. What are they? And please explain what these socio-economic and scientific and technical factors are important for. The success of restoration efforts? Overall, this needs clarification.	Removed and rewritten as "There is a real imperative to make restoration economically viable which . This latter point can be especially effective if restoration activities are coupled with employment and income generation Secretariat of the Convention on Biological Diversity, 2014) and/or with demonstrable gains in biodiversity and ecosystem services."
Katalin Török	Ch.3	36	1096		1098	format problems	Format has been fixed for the final draft.
Marieke Sassen	Ch.3	36	1097	36	1097	Please clarify that economic viability is an important factor (a "point" is unlikely to be effective) for the success of restoration efforts, especially if they are coupled with employment and income generation opportunities	Rewritten as part of P36 L1095 to P36 L1096 comment above
U.S. government	Ch.3	36	1100	36	1106	Please include a greater discussion on restoration efforts. For example, while "ecological restoration" is small-scale, current efforts and interest in forest landscape restoration (FLR) is high profile under Bonn Challenge (150 million ha by 2020), NY Declaration on Forests (350 million ha by 2030), LAC 20x20, AFR 100, UN Strategic Plan for Forests (increase forest cover by 3% globally).	Amended to read "The need for restoration is global with many initiatives underway including the Bonn Challenge mentioned previously, the New York Declaration on Forests (restore 350M ha by 2030; http://www.un.org/climatechange/summit/wp-content/uploads/sites/2/2014/07/New-York-Declaration-on-Forest—Action-Statement-and-Action-Plan.pdf), Initiative 20x20 (20M ha of degraded land in Latin America and the Caribbean into restoration by 2030; http://www.wri.org/our-work/project/initiative-20x20), AFR 100 (100 M ha of land in Africa into restoration by 2030; http://www.afr100.org/) and the UN Strategic Plan for Forests 2017-2030 to increase forest cover by 3% globally (http://www.un.org/esa/forests/wp-content/uploads/2016/12/UNSPF_AdvUnedited.pdf). Most of the restoration action for these programs is primarily undertaken at local scales with success reliant on ..."
Marieke Sassen	Ch.3	36	1107	36	1107	Replace "Forests" with "Managed forests"?	The term managed forests is now used
Eila Gendig	Ch. 3	36	1107	43		Use of fuelwood is covered in both chapters (3.4.4 and 3.4.5)	The section on forests (3.3.3) considers fuelwood for industrial use, particularly from plantations, whilst the section on non-timber forest resources (3.3.4) is focused on the collection of fuelwood from native forests, typically for household use
Finnish Government	Ch. 3	36	1109	36	1124	First paragraph describes intensive forest management chains. Description of the main silvicultural management regimes in relation to their impact on biodiversity and land degradation would be required here. Biodiversity decline is an inevitable consequence of removal of wood from a forest ecosystem (which would also merit to be said in the chapter for forests), but the severity of these adverse effects is dependent on the intensity of the wood removal. As a general rule the higher the proportion of wood left on site and the longer the rotation period (or even no rotation period at all as in continuous cover management) the lower the negative impact.	A description of main intensive silvicultural practices is now given, highlighting that impacts on biodiversity are directly related to intensity of management
Marieke Sassen	Ch.3	36	1114	36	1114	Delete "However"	Deleted

						Influential arguments are being presented by global bodies and initiatives (e.g. the Bonn challenge) for the extensive afforestation of grasslands and savannas on the ground that these areas should be forests but have been degraded, especially in Africa. These arguments do not take account of the fire-driven nature of these grass-fueled ecosystems or the fact that such afforestation, should it go ahead, will undoubtedly result in reductions in water availability and decrease water security not to mention losses of biodiversity. Extensive areas of these grasslands have endemic species whose adaptations and lineages clearly show that they have adapted to fire over millennia. They are ecosystems in their own right and this report should be particularly careful about being used to bolster these flawed arguments. I am not mimising the importance of deforestation in areas that were demonstrably forested, as discussed at length in the report, just arguing that the legitimacy of other ecosystems/biomes also needs to be recognised. Jackson et al 2005 Science 310: 1944-1947 is one of many papers that has made the point that extensive replacement of other vegetation by planted forests had negative impacts on water security among other things	Section 3.3.3 now includes additional text highlighting the negative impacts of tree plantings on grassland and savannah land, and underscores that "The replacement of grasslands or other naturally non-wooded biomes by planted forests results in widespread loss of biodiversity and other environmental impacts, including impacts on water security, and cannot be considered FLR "
David Le Maitre	Ch.3	36	1116	36	1120		
Marieke Sassen	Ch.3	36	1118	36	1118	Add caveat that this depends with what species the land is being reforested and how it is managed, i.e. on the presence of natural forest pockets and corridors	New text added emphasizing the potential negative impacts of introducing alien tree species, as well as the importance of retaining fragments of native forest
Katalin Török	Ch.3	36	1119			citation format	Citation format was finalized on final rendition of the text
Finnish Government	Ch. 3	36	1121	36	1124	Second paragraph describes a recent societal response (RIL) to the adverse effects of logging-only-management practise. What about the extent of intensive, RIL and other forest management practises? Coverage? Proportion? And how much of the exploited forests remain outside of these practices? Still today, how common are commercial timber loggings without any active input to ensure regeneration of the site?	We lack reliable data on the extent of RIL practices, though their extent remains limited and this has been emphasized in the text.
Finnish Government	Ch. 3	36	1122	36	1122	omit ". RIL"	Text changed
Katalin Török	Ch.3	36	1122			citation format	Citation format was finalized on final rendition of the text
Finnish Government	Ch. 3	37	1128	37	1128	Could you pls give definition for the term "naturally regenerating forests". What is spontaneous regeneration? Logging-only sites with no management practises besides timber harvesting? Seed-tree-logging regime? Sowing/planting with indigenous/local propagation material?	The term naturally regenerating forests is no longer used in the revised text
Finnish Government	Ch. 3	37	1128	37	1129	How come that demand for wood resources would be an indirect driver of forest management? Isn't it the main direct driver? An indirect driver of deforestation, perhaps, but certainly not indirect in case of management.	The demand itself is by definition an (economic) indirect driver - it is not the driver that is actually impacting the forest, which is the forest management itself.
Finnish Government	Ch. 3	37	1131	37	1132	Inappropriate citing." Just as European consumption of forest products increased ca. 50% with increasing prosperity in the latter half of the 20th Century (Nabuurs et al., 2007)" cited by Sloan and Sayer 2015.	Text changed
Katalin Török	Ch.3	37	1134			citation format	Citation format was finalized on final rendition of the text
Finnish Government	Ch. 3	37	1135	37	1135	An appropriate reference needed.	Reference now added (Bais et al.)
Finnish Government	Ch. 3	37	1136	37	1136	Pls, define the term "modern woodfuel".	The term modern woodfuel is no longer used - just woodfuel
Marieke Sassen	Ch.3	37	1136	37	1136	Specify what modern woodfuels are	The term modern woodfuel is no longer used - just woodfuel
Finnish Government	Ch. 3	37	1137	37	1137	An appropriate reference needed.	Reference now added (Bais et al.)
NFP of China	chapter 3	37	1138	37	1140	This is inconsistent with the statistics of the China Forestry Administration, China is only a processing country, the final consumer is still developed countries such as Europe and America, we propose to delete the example of China	First clause of sentence is deleted to now start sentence more generally, "Demand for wood products in the Asia-Pacific region ... "
Cantele, Matthew	Ch. 3	37	1140			Again here the chapter is including futures which are covered extensively in Chapter 7	It is appropriate to have some joint treatment of key topics between chapters
Katalin Török	Ch.3	37	1146			citation format	Citation format was finalized on final rendition of the text
Katalin Török	Ch.3	37	1149			citation format	Citation format was finalized on final rendition of the text
Marieke Sassen	Ch.3	37	1167	37	1167	"conversion elsewhere"	Fixed
Katalin Török	Ch.3	37	1171	38	1183	citation format (4 authors spelled out)	Citation format was finalized on final rendition of the text

Marieke Sassen	Ch.3	38	1184	38	1184	make new paragraph after "Sloan, 2013)."	New paragraph added
Katalin Török	Ch.3	38	1186		1189	citation format	Citation format was finalized on final rendition of the text
Shenggong LI	Ch.3	38	1188	38	1188	Input a box to introduce "REDD", and "REDD+".	We have not introduced a new box to explain REDD due to lack of space
Eila Gendig	Ch. 3	38	1192	39	1259	Is it worthwhile to discuss planting of native trees and their impacts on land degradation vs. purposefully planting non-natives? Impacts of non-natives on lands and soils? Opportunity to establish niche markets for specialty timber? Diversification in the forestry space?	Benefits of planting native versus exotic trees is given comprehensive treatment in Chapter 6.
Steve Prince	Ch. 3	38	1192			More Ch.4 status and trends. See comment on line 737	This text in Chp 3 focuses on changes in forest area due to specific drivers (e.g. commercial agriculture)
Marieke Sassen	Ch.3	38	1194	38	1195	Needs a definition of non-managed/ managed forests	Definition added - forests not managed for timber extraction
Marieke Sassen	Ch.3	38	1200	38	1228	These two paragraphs are both based on the FRA 2015 (needs harmonising of wording on this among the paragraphs)	Paragraphs now more closely harmonized
Steve Prince	Ch. 3		1200		1200	Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A., Tyukavina, A., ... Townshend, J. R. G. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. <i>Science</i> , (15 November 2013), 850–853. http://doi.org/10.1126/science.1244693	Reference cited.
Marieke Sassen	Ch.3	38	1202	38		from"= "by"?	Changed to by
Diana Patricia Alvarado-Solano	Ch.3	38	1212	38	1214	For trends in deforestation of tropical dry forests revise: Janzen, D.H. (1988). Tropical Dry Forests: The most Endangered Major Tropical Ecosystem. Pp: 130-136. <i>In: Wilson, E.O. & F.M. Peter (Eds.). Biodiversity. National Academy Press. Washington, D.C. Also, Miles et al. (2016). A global overview of the conservation status of tropical dry forests. DOI: 10.1111/j.136-2699.2005.01424.x. And also: Portillo-Quintero & Sánchez-Azofeifa (2010). Extent and conservation of tropical dry forests in the Americas. DOI: 10.1016/j.biocon.2009.09.020</i>	This sentence on dry forests and mangroves is no longer in the chapter
Finnish Government	Ch. 3	38	1213	38	1213	... with tropical dry forests...	Next on conversion of forests now omitted from this section (and treated in Chapter 4)
Shenggong LI	Ch.3	38	1215	38	1216	"of the Food and Agriculture organization of the United Nations (FAO)"-->"(FAO 2015)"	Citation format was finalized on final rendition of the text
Marieke Sassen	Ch.3	39	1220	39	1220	Same numbers as in line 1204. Please revise to avoid duplication	Revised.
Marieke Sassen	Ch.3	36	1222	36	1222	Bit of sentence missing after the reference. What about RIL? Is the practice being promoted? And by whom (the ITTO for example). Is it's implementation increasing? Please explain. Adding something on SFM would be appropriate here.	New text on RIL and SFM now added.
Marieke Sassen	Ch.3	39	1222	39	1225	Largest areas are in EA and Europe, but then in the list of top 20 countries there is no Europe. Or is the Russian Federation included? Or alternatively is the first statement about relative area?	This paragraph has now been revised to improve clarity and remove this apparent inconsistency
Marieke Sassen	Ch.3	39	1229	39	1231	Repetition on the 35% increase	Repetition removed.
Marieke Sassen	Ch.3	39	1232	39	1232	Cut sentence after "annum"New sentence start with "In the other climatic domains, there was either no change or a slight decline."	Proposed change accepted.
Marieke Sassen	Ch.3	39	1233	39	1233	Delete this line. Already said above	Line deleted
Marieke Sassen	Ch.3	39	1234	39	1234	Similarly to what? Clarify	"Similarly" removed
Katalin Török	Ch.3	39	1235			citation format	Citation format was finalized on final rendition of the text
Finnish Government	Ch. 3	39	1241	39	1241	Pls, define the term "regenerating" forest.	Regenerating forest now defined as "forest regenerating after logging or some other form of disturbance"
Finnish Government	Ch. 3	39	1241	39	1242	Pls, clarify the sentence; "Moreover, rates of timber extraction have recently accelerated." As well as "logging intensity" of the following sentence.	Statement starting "Moreover " now been removed, and logging intensity has been defined.
Finnish Government	Ch. 3	39	1244	39	1244	Specifically, the term "timber extraction rate"? Change in time (greater harvesting frequency i.e. shorter rotation period) ? Change in logged amount (higher wood volume/mass per surface area)? Change in forest area affected by logging or harvesting?	Now use logging intensity - stems per ha - for consistency
Finnish Government	Ch. 3	39	1245	39	1246	Borneo was affected by previously undocumented , high intensity logging operations. Pls, clarify what was undocumented and define "high intensity logging operation".	High impact clarified as being multi-cycle logging
Katalin Török	Ch.3	39	1248			citation format	Citation format was finalized on final rendition of the text
Sandhya Chandrasekharan	Ch.3	39	1251	39	1253	reference required. Sustainable forest management for timber?	SFM in general, not just for timber. Reference added - MacDicken et al.

Finnish Government	Ch. 3	39	1251	39	1259	Would this paragraph fit better into ch. 3.4.4.1 'Changes in the extent and management of forest and tree plantation'?	We believe this content is better treated here
Shenggong LI	Ch.3	39	1251	39	1259	Input a box to introduce " sustainable forest management (SFM)".	We have not introduced a new box to explain SFM due to lack of space
Finnish Government	Ch. 3	40	1261	40	1261	Increase in surface area of FSC certified forests (NOT growth). Note the problem with the vertical axis values	Graph has been revised.
Zhao Gengxing	Ch.3	40	1263			"3.4.4" should be "3.4.5", the same as following	The section number has now been corrected.
Eila Gendig	Ch. 3	40	1263	43		Chapter on non-timber resource extraction could provide more details on different resources extracted - building materials, soil substrate (e.g. gravel, sand), fibres are not covered	Extraction of building materials including gravel and sand are indeed major issues. Gravel and sand mining are now discussed in the section on mineral resource extraction (3.3.5) which we believe is more appropriate place for it. We acknowledge that extraction of material for fibre is only briefly mentioned. However, due to length restrictions we are unable to discuss all NTFRs in detail.
Germany	Ch.3	40	1265	30	1268	The list of NTFP must be questioned since charcoal and fuelwood are mentioned. Beer and McDermott the two referenced authors here define NTFP as "all biological materials other than timber which are extracted from forests for human use"; this definition does clearly not apply neither to charcoal nor to fuelwood.	We agree that several definitions of 'non-timber resource products' do not include charcoal and fuelwood. To maintain consistency of the overall structure, we are unable to treat fuelwood and charcoal as a separate section. We now clearly state that for the purposes of this assessment we consider fuel wood and charcoal as non-timber natural resources.
Katalin Török	Ch.3	40	1273		1274	citation format (4 authors spelled out)	Citation format was finalized on final rendition of the text
Germany	Ch.3	40	1286	40	1286	Since fuelwood is not a NTFP (see comment above) it should not be referred to as such.	This is the same as an earlier comment. We agree that several definitions of 'non-timber resource products' do not include charcoal and fuelwood. We now clearly state that for the purposes of this assessment we consider fuel wood and charcoal as non-timber natural resources.
Sandhya Chandrasekharan	Ch.3	40	1289	40	1290	quantitative data and trade flows of the major products would be useful to advocate trade restrictions or ecologically informed pricing	While we agree that such data are useful to advocate trade restrictions and ecologically informed pricing, the focus of this chapter is restricted to describing status and trends in the drivers, and so we do not discuss this here.
Germany	Ch.3	41	1294	41	1301	All the examples around fuelwood (and partly also charcoal) should be deleted since these are not NTFP.	We agree that several definitions of 'non-timber resource products' do not include charcoal and fuelwood. We now clearly state that for the purposes of this assessment we consider fuel wood and charcoal as non-timber natural resources.
Katalin Török	Ch.3	41	1297			citation format	Citation format was finalized on final rendition of the text
Marieke Sassen	Ch.3	41	1301	41	1304	There is an important international trade in NTFPs which need to be acknowledged here. E.g. plants products from Central Africa being exported to urban centres in Europe (P. Africana, Gnetum spp. See Verina Ingram, Jolien Schure. 2010. Review of Non Timber Forest Products (NTFPs) in Central Africa, Cameroon. Center for International Forestry Research. Or Tabuna, H. (1999). Le marche des produits forestiers non ligneux de l'Afrique Centrale en France et en Belgique: produits, acteurs, circuits de distribution et débouchés actuels. Bogor, Indonesia, CIFOR: 32p	We have now included a sentence at the end of the next paragraph which highlights the international trade in medicinal plants.
Germany	Ch.3	41	1313	43	1360	Check listing of fuelwood and charcoal with the definition above.	We now clearly state that for the purposes of this assessment we consider fuel wood and charcoal as non-timber natural resources.
Katalin Török	Ch.3	41	1314			citation format	Citation format was finalized on final rendition of the text
Eila Gendig	Ch. 3	42	1326			diagram 3.9 a): difference in fuel wood use between the 5 years is not distinguishable. How about using a long-term (50-year) timescale?	We have now revised the figure to show longer-term trends. Also, we have combined Figures 3.9 and 3.10, and only present data on charcoal use. We now show a) charcoal consumption from 1961 to 2015, and b) projected charcoal use until 2030.

Marieke Sassen	Ch.3	42	1354			"Projected firewood..."	This figure has now been revised, and we only present data on past trends and projected future use of charcoal. We have revised the figure legend to state that these are projected estimates.
Germany	Ch.3	42	1354			This Figure has a low resolution quality. Please improve.	We now provide a better quality figure.
Katalin Török	Ch.3	43	1362		1363	citation format	Citation format was finalized on final rendition of the text
Katalin Török	Ch.3	43	1368			cit format: E. L. Bennett, 2002	Citation format was finalized on final rendition of the text
Germany	Ch.3	43	1375	43	1376	The phrase should be formulated focusing on the decline / loss of species if unsustainable use continues. This would also result in difficulties to maintain the protein supply. However up to this phrase it was not mentioned in the text that current extraction levels are considered unsustainable, that also needs to be further elaborated.	We have revised the sentence to first talk about decline and loss of species, and then the potential impacts on human communities. We do mention in an earlier sentence that extraction levels in many regions are considered unsustainable, and provide a citation at the end of this sentence which concludes that extraction in the Congo basin is also likely to be unsustainable.
Cantele, Matthew	Ch. 3	43	1375			My impression was that there is some disagreement over whether current bushmeat harvests in the Congo are sustainable. Further, a shift from bushmeat to fish as the primary source of protein would not be sustainable given the state of coastal fisheries	Assessing sustainability of bushmeat harvest is indeed hard given the lack of high quality data on harvest amounts, demographic rates of harvested populations, and other biases in research efforts (e.g data collected based on market studies etc). Available projections for the future based on data currently available suggest that in the absence of measures to ensure sustainable harvests in the face of rising human populations and increasing commercial offtake, wildlife populations are likely to decline in many places, as we have noted here. Further, as pointed out in the comment, alternate options (e.g. fish) may not always be available or feasible given the state of coastal fisheries. However, given space limitations, we are unable to discuss the impacts and consequences of dietary shifts in any detail here.
Katalin Török	Ch.3	43	1377			Fa, Currie, & Meeuwig 2003	Citation format was finalized on final rendition of the text
Katalin Török	Ch.3	43	1379			citation Fa + authors	Citation format was finalized on final rendition of the text
Javier Ernesto Cortés Suárez	Ch.3	43	1381	43	1381	These should include some other consequences such as desertization (encompassing both natural and man-induced causes of extension of deserts or degraded land), desertification (man-made desertization) and sabanization (direct effect where native vegetation is replaced by invasive species adapted to fire).	Our focus in this chapter is primarily on the extent and trends in the drivers (e.g changes in fire regimes), while impacts and consequences are discussed in later chapters.
Pavlos Tyrologou and María José Rubial from the Panel of Experts on Soil Protection of the European Federation of Geologists (PESP-EFG)	Ch.3	43	1381	46	1499	It is not clear enough whether we are talking about natural-spontaneous fires or any kind of fire, including arson and those that happen accidentally. Most forest fires are man-made, either directly (intentionally) or indirectly (accidentally). Only a minimal percentage occur natural or spontaneously. What kind of fires are we talking about in this chapter? Indeed this is a point of great interest within this area of knowledge, but it is important to clarify the uncertainty of the numerical data regarding the origin of the fire. In many cases, these fires are the cost of inaction by the competent administrations, so it is also important to convince other players, within the industry and productive fabric, of the advantages and disadvantages of a fire, from the view of an economic analysis of the costs of fires: costs of land and other environmental damage recovery, avoided costs and the production function, and their GHG and other balances.	We address changes in fire regimes arising from all kinds of fires, both natural and man-made, in this section. We now also point out that most fires today are man-made, and that human effects on fire regimes can be substantial, often overriding climatic effects. Due to space limitations, we are unable to discuss the costs on inaction by competent authorities in much detail, but we do not provide some estimates of annual fire suppression costs in the US and Canada, and total wildfire costs in Australia.
U.S. government	Ch.3	43	1381	46	1499	Section 3.4.6.3 on Fire; no mention of megafire increases due climate change and past suppression; also increase in fires in European Mediterranean due land abandonment (or at least abandonment of active management).	We have now included mentions to land abandonment in the Mediterranean and the results of fire suppression on fuel accumulation and megafires.
Shenggong Li	Ch.3	43	1381	51	1656	there are two sections for 3.4.6	This has been corrected
Katalin Török	Ch.3	43	1387			Bond & Keeley, 2005	Citation format was finalized on final rendition of the text

						Much of the woody plant encroachment in African (and Australian) savanna and grassland biomes is being driven by overgrazing reducing fuel loads and thus fire intensity, enabling woody plants to recruit seedlings and escape the fire trap (see papers by Willam Bond, including those cited in this chapter). This interacts synergistically with CO2 increases see Midgley and Bond 2015 Nature Climate Change 5: 823-829 for an African review). This form of land degradation should be included in this introductory paragraph as it affects significant areas of the globe both for human livelihood security and for wildlife and the services they provide including tourism. See also Stevens et al Phil Trans Roy Soc B 2016 371.	We do point out the role of grazing management in influencing fuel loads and fire intensities in the 'Indirect drivers of changes in fire regimes' sub-section. Additionally, we also discuss the individual and synergistic effects of different drivers of bush encroachment in the section on 'Climate change as a threat multiplier'. We have included these suggested references here and elsewhere as appropriate
David Le Maitre	Ch.3	43	1389	43	1398		
Katalin Török	Ch.3	43	1392		1393	Le Page et al 2010	Citation format was finalized on final rendition of the text
						There are numerous papers by Sally Archibald, Carla Staver and others on the role of fire in savanna boundaries (woody-grass interactions) and human influences on fire regimes, for example Archibald et al. 2010 Int J Wild Fire 19: 861-878, 2009 Global Change Biology 15: 613-630; Staver et al. 2011 Science 334: 230-232. I find it astonishing that these papers and similar work in Australia by Bradstock and others are not summarised in this section.	We have broadly synthesized the keyfindings of this body of work in this section. Due to length limitations, we are not able to discuss all of this work in too much detail. We have included some of the key citations suggested.
David Le Maitre	Ch.3	44	1408	44	1416		
Katalin Török	Ch.3	44	1416			Moreira et al. 2010	Citation format was finalized on final rendition of the text
Marieke Sassen	Ch.3	44	1421	44	1421	"Altered flammability": do you mean different? Or that it has changed?	We have now reworded the sentence to make it clearer.
Katalin Török	Ch.3	44	1423			Foxcroft et al. 2010	Citation format was finalized on final rendition of the text
						I suggest include: "Fire regimes can be influenced by the nature of grazing management, fuel harvesting, weak law and norms systems, including conduct norms, and weakness in the law application when exists ; and their interaction with behavioral aspects of fire ignition by people	This has been revised from the 2009 and now focus on the cultural factors, along with traditional knowledge systems and practices, are also important drivers of fire regimes. These include cultural and traditional practices related to crop and grazing management, fuel harvesting, the use of fire to clear land for shifting cultivation, burning
Cristobal Diaz	Ch 3	44	1425	44	1426		
						I wouldn't call property rights a cultural driver (its an institutional driver) and I am not sure cultural drivers lead to the on-purpose introduction of flammable species. Needs a bit more elaboration.	We have now moved property rights to policy and institutional drivers, removed the text on introduced species (which is already discussed earlier), and rephrased the sentence to improve clarity.
Marieke Sassen	Ch.3	44	1426	44	1427		
Katalin Török	Ch.3	44	1427		1428	Taylor et al., 2016	Citations will be standardized in final rendition of the text.
Marieke Sassen	Ch.3	44	1429	44	1432	A mix of context and examples of management approaches and policy. Needs a bit more flesh on the policy and institutional side.	We have tried to clarify this section and provide more details (within the constraints of word limits)
						For example, in the Valle del Cauca (Cauca Valley) region in Colombia, for many decades the sugarcane harvesting techniques included burning the crops to facilitate the later harvest process by the workers, affecting in this way the few remnants of tropical dry forests, the wetlands and riparian forests. As a result, the rural community was forced to leave their lands and moved out to near cities.	This is indeed an interesting example of how cultural practices can affect fire regimes. However, due to length limitations we are unable to discuss case studies and examples in any depth. We have however included a mention to crop management as an additional factor.
Diana Patricia Alvarado-Solano	Ch.3	44	1429	44	1430		
Katalin Török	Ch.3	44	1438			Krawchuk et al. 2009	Citations were standardized in final rendition of the text.
Marieke Sassen	Ch.3	44	1439	44		"The time span of available datasets..."	The sentence has been reworded as suggested
						Please amend the text to reflect a nuance in Australia's fire regime. Fire numbers declining in Australia in recent years is referenced. There is regional variability in these figures. There is likely a decline in the number of annual fires in northern Australia (due to all the Emission Reduction Fund projects) and an increase in southern Australia – in both fire numbers and average/median fire size. As climates dry, fuels become more available in southern forests – resulting in more fire activity. In central Australia, fire is dependent on rain and growth of grasses, so as it dries with climate change, there are less fires. Please amend the text to reflect a nuance in Australia's fire regime.	We have revised this bit of text and now discuss results from a more recent analysis of trends in global burned areas (Andela et al. 2017). Further, we now discuss broad scale trends in burned area in the text, rather than focus on region specific patterns. However, we have now included a map on global burned area, and trends over time, which gives the reader an idea of regional variability in patterns.
Australia NFP	Ch.3	45	1447	45	1457		
						Clarify how deforestation and changing practices are likely to have influenced these trends	We have revised this section of text and now discuss broad scale trends in burned area, rather than focus on region specific patterns and drivers, i.e. deforestation as a specific driver in different regions is no longer discussed.
Marieke Sassen	Ch.3	45	1452	45	1453		
						Move to section 3.4.6.1.? This is more description of the impacts than trends	This text has been slightly revised now. We agree that there is some discussion of 'impacts' here. However, we have included it to highlight the effects that changing fire regimes can have in different biomes.
Marieke Sassen	Ch.3	45	1462	45	1472		

						This is far too sweeping a statement to be made based only on one reference which was a technical report and not in the peer reviewed literature. It also seems to have focused on "forested" environments, making the common assumption that much of the savanna and grassland is degraded forestry. The statement and what follows is not supported by many other works, including those I have noted above and even some cited in the sections on fire. Papers by Bowman for the globe, Murphy et al 2013 J Biogeog 40: 1048, Jolly et al. 2015 Nature Comm 6: 7537 (cited in chapter), Lehmann et al. 2014 Science 343: 548; Krawchuk et al. 2009 PloS One 4: e5102 do not support such widespread changes especially in Africa and Australia.	We have now reformulated this paragraph and have fleshed it out in more detail. We now also give greater coverage to tropical savanna and grassland ecosystems, and have also included additional citations as suggested.
David Le Maitre	Ch.3	45	1462	45	1472		
Shenggong Li	Ch.3	45	1467	45	1469	" (Shlisky et al., 2007)..... (Shlisky et al., 2007)"-->" (Shlisky et al., 2007)"	This has been corrected.
Katalin Török	Ch.3	45	1467		1469	format	Citations were standardized in final rendition of the text.
Shenggong Li	Ch.3	45	1474	45	1479	" increased droughts can reduce fuel loads and fire frequency"(not consistent with line 1479)-->" increased droughts can increase fuel loads and fire frequency"	These statements are not contradictory or inconsistent. Droughts can have different effects on fire regimes in different biomes: it can increase fire frequency in productive wet areas like tropical forests by lowering humidity and increasing fire risk, but lead to decreased fire frequency in arid regions because of their negative effect on fuel loads.
Katalin Török	Ch.3	45	1476		1485	citation format	Citations were standardized in final rendition of the text.
Katalin Török	Ch.3	46	1495		1496	add citation to prescribed burning	We have now added a citation for this.
Zhao Gengxing	Ch.3	46	1498	46	1499	Table 3.4 shows fire regimes across biomes and impacts on BES, while the impacts on land degradation should be explained.	Our focus in this chapter is primarily on the extent and trends in the drivers, while impacts are discussed in later chapters. This table has been removed and the contents integrated with the text, where we briefly touch upon impacts in a few places.
David Le Maitre	Ch.3	46	1498			The persistent failure of this review of the impacts of humans on fire regimes to address savannas and grasslands is reflected in a simple mention in the final row of this table. This bias is simply not acceptable and the underemphasis on the drivers and impacts in these key environments also is reflected in the suggested responses. I strongly recommend that Dr William Bond and other savanna and grassland fire experts are invited to contribute to this chapter to correct the many deficiencies I have highlighted above	We agree that the discussion on savannas and grasslands was limited. We now include a more detailed discussion of savannas both in this section, as well as in other sections of the chapter (e.g. climate change, drivers of restoration and rehabilitation)
Marcus Zisenis	Ch.3	47	1500	48	1656	The values of non-native species for land use and ecosystems should be differentiated and not stigmatised without case-by-case evaluation (e.g. Davis, Mark A., et al. "Don't judge species on their origins." Nature 474.7350 (2011): 153-154. https://www.fs.fed.us/global/iitf/pubs/ja_iitf_2011_Davis001.pdf)	This section addresses invasive species, not non-native species
Zhao Gengxing	Ch.3	47	1500			"3.4.6" should be "3.4.7", the same as following	Corrected
Germany	Ch.3	47	1502	47	1504	Ensure alignment of definitions also between IPBES Assessments. Therefore, check the definition of invasive alien species used in IPBES Deliverable 3b(ii) against the one outlined at the start of chapter 3.4.6.1. In IPBES Deliverable 3b(ii), invasive alien species are defined "as animals, plants or other organisms introduced directly or indirectly by people into places out of their natural ranges of distribution, where they have become established and dispersed, generating an impact on local ecosystems and species." (source: IPBES/5/INF/10; Annex, page 2, para 2).	Definitions are aligned with other IPBES assessments
David Le Maitre	Ch.3	47	1502	47	1510	Richardson et al. 2000 and recent papers by Tim Blackburn and others (2011 TREE) provide improved definitions of invasion terminology and concepts for the readers of this report	The basis of this assessment is the definitions provided by IPBES
Germany	Ch.3	47	1504	51	1565	Line 1504 "Some introduced species do not become invasive [...]", Line 1565 "a large fraction of which have become invasive [...]." --> The number/fraction of alien species that does not become invasive can be quite large, depending on species group and place (e.g. the number of alien vascular plants in Germany largely outnumbers the amount of vascular plant species we define as invasive alien species). I therefore suggest to revise both statements.	Text edited to account for comment
Eila Gendig	Ch. 3	47	1512		1528	Pathogens are as invasives and detrimental as alien plant and animal species - Invasions of plant pathogens can significantly alter local ecosystems. There is potential that pathogenic microorganisms severely inhibit growth of or eradicate local species	Micro-organisms were included in the definition

Finnish Government	Ch. 3	47	1530	47	1530	Introduction of exotic species by purpose is an important direct driver of the spread of invasive species (tree plantations, fruit orchids, revegetation of contaminated sites ...)	New text has been added to reflect importance of direct introductions
Katalin Török	Ch.3	48	1555			Neff et al. 2005	Citations were standardized in final rendition of the text.
Finnish Government	Ch. 3	48	1557	48	1157	albedo effect more linked to deforestation or other more drastic changes of the vegetation cover than to composition change	Not necessarily the case. Bromus tectorum has substantially changed albedo in western US. Text remains unchanged.
Marieke Sassen	Ch.3	48	1557	48		Soil erosion also leads to siltation of dams and reservoirs with the same effect on water supplies see Lal 1998 in Chapter 4	Soil erosion and siltation is addressed elsewhere in the report
Katalin Török	Ch.3	48	1559		1561	Gariepy et al. 2014; Newcombe et al. 2000	Citations were standardized in final rendition of the text.
Shenggong Li	Ch.3	48	1560	45	1560	reword " can also native survival"	Sentence removed in revised text
Marieke Sassen	Ch.3	48	1562	48	1562	Dates are mentioned in the title which are not found back in the text. Please clarify this	Title revised to not include dates
Germany	Ch.3	48	1579	48	1581	It is not quite clear, what is meant by "...", which may reflect many centuries of adaptation to human societies ...". Please clarify.	Tentative explanation removed
Finnish Government	Ch. 3	48	1579	48	1583	"Many Australian <i>Acacia</i> species and American <i>Prosopis</i> species have become invasive in Africa (Mathews and Brand 2004) and although <i>Eucalyptus</i> species are not considered to be highly invasive in South America, <i>Eucalyptus camaldulensis</i> has become a serious problem in southern Africa (Stanturf et al 2013)." This sentence better suited here than to Ch 3.5.2 lines 1925-1943	Section 3.5.2 was removed in the FGD. This section has now been moved into the Invasive Species section.
Marieke Sassen	Ch.3	48	1581	48	1581	Clarify logic. Adaptation to human societies of native or invasive plants?	This has been revised and clarified.
Germany	Ch.3	49	1590	49	1592	"A combination of changes in climatic and geological events, together with global trade, economic activities [...]" --> It's a strange mix of processes happening at very different timescales: climatic, geological events are very long-term processes, while the timescale for significant increases in global trade leading to significant IAS spread is comparatively short. I suggest to revise the sentence.	Fact that these processes are happening at different timescales is now clarified in the text
Katalin Török	Ch.3	49	1590			Lowe et al. 2000	Citations were standardized in final rendition of the text.
David Le Maitre	Ch.3	49	1597	49	1566	Although many analyses point to globalisation and increased flow of goods to developed from developing countries, the potential to move invasive species is actually in both directions both in ships and in returning containers. Developing countries are potentially at a higher risk as they lack resources to prevent invasions and undertake effective early responses compared with developed countries.	Importance of two-way flow of invasive species due to globalization is now emphasized
Marieke Sassen	Ch.3	49	1607	49	1607	"Fire cycles are increasing with temperature": clarify if this refers to fire frequency, length or interval time.	Now clarified to read "Fire-return intervals and becoming shorter with increasing temperatures"
Marieke Sassen	Ch.3	49	1610	49	1610	Start new paragraph after "above"	Revised and done.
Marieke Sassen	Ch.3	49	1627	49	1627	Please clarify what is meant by "proactive capacities" and "such programs". Give an example?	Examples now given of what is meant by proactive capacities
Germany	Ch.3	50	1631			This Figure has a low resolution quality. Please improve.	Higher resolution version was included in final copy
Germany	Ch.3	50	1635	50	1635	It needs to be included, what the abbreviation "UNCTAD" stands for.	UNCTAD now defined
Marieke Sassen	Ch.3	50	1636	51	1656	I would suggest removing the detail on the data (sources) used but keep the information on what each map shows.	Detail has been kept as we think this is important
Katalin Török	Ch.3	51	1654			Halpern et al. 2008 Missing from the litr	Reference added
Virginia Meléndez Ramírez	3	51	1657	51	1657	e.g. http://www.gob.mx/se/acciones-y-programas/mineria but see https://chapingo.mx/revistas/revistas/articulos/doc/r.rga.2016.57.010.pdf	Usefull additional citations that were added.
U.S. government	Ch.3	51	1657	53	1762	Section 3.4.7 Mineral extraction and energy development has no mention of artisanal mining that causes localized but significant degradation especially of water resources. Serious environmental problem in Africa, in addition to the human costs. Also, in energy development, there is no mention of hydropower development taking place or contemplated in Asia and South America and the effects.	Excellent point about the growth of artisanal mining in parts of South America and Africa. Some recent work was added to highlight these issues. However, it is very hard to find nationalized data on the subject so it is more a mention of how diverse the extractive sector can be and that makes it hard to fully estimate its impacts.
Finnish Government	Ch. 3	51	1662	51	1663	The industries provide raw material for the necessary goods of a modern society, such as steel, concrete, plastics, tubing , as well as electronical devices for communication industry and alternative energy	Good idea to improve sentence clarity. Changed.

U.S. government	Ch.3	51	1668	51	1670	Biodiversity is not and should not be conflated with an ecosystem service, which the current clausal structure of the sentence seems to imply. Please revise. As demonstrated by definitive quotes early in Ch 1, biodiversity is not and should not be confused with an ecosystem service. Biodiversity is a measurable characteristic of natural capital in a certain place. Ecosystem services that flow from that natural capital will not include biodiversity (an aspect comprising the natural capital). In Ch 7, the Introduction (p. 6, from line 168) maintains the distinction clearly.	Good point, thank you. Was clarified throughout
Finnish Government	Ch. 3	51	1676	51	1681	More useful categorization would be according to the environmental impact caused by the mining (and ore concentrating) activity: toxic/acidifying/eutrophating emissions to air/water. Sand- and gravel extraction (probably the one with largest volume within the resource extraction sector) should be included here (no toxic emissions, but harmful ones in addition to destroying of large land areas. Diamonds and diverse stones and minerals for hi-tech, jewellery etc. Should perhaps also be mentioned.	After exploring this option, we decided this kind of categorization went beyond the scope of the chapter and did not map well onto the primary database of mining production values that we used. However it is a good idea and highlights the need for a comprehensive way to map resource onto extraction method and then onto expected impacts.
Finnish Government	Ch. 3	51	1684	51	1684	include the term "open pit mining"	Added
Marieke Sassen	Ch.3	52	1688	52	1688	Move to section 3.4.7.	Moved significant parts of the introductory text around.
Finnish Government	Ch. 3	52	1691	52	1691	replace "ore quality" by "ore grade", delete "for a broad array of ores"	Done
Katalin Török	Ch.3	52	1694		1696	citation format	Corrected
Eila Gendig	Ch. 3	52	1700			Coincidentally or on purpose? Seems to be an odd relationship, so explanatio would be appreciated. Due to unaccessible places are the only regions left with high biodiv and valuable mineral sources?	This is a very good question and we tried to address it in the text, however there is little justification in the literature explaining the overlap between high biodiversity areas and mines.
NFP of China	chapter 3	52	1707	52	1711	The problem does not meet the actual situation in China. China has banned the export of rare earth mines.we recommend to delete the example of China	We looked into this and it looks like for brief while the Chinese government lowered REE exports, however that situation has since reverted back to high exports of REEs from China and the total global contribution from China still dwarfs any other nation. Original text has been kept, also following agreement as to the veracity of this statement with NFP of China
Finnish Government	Ch. 3	52	1710	52	1710	correct term here is "rare earth elements "(REEs)	Changed
Finnish Government	Ch. 3	52	1710	52	1713	..., but almost all minerals used for extraction of REEs are exported from China (D & G 2011) . This specific example represent a broad trend that production of the minerals to fulfill the relatively new need of REES is highest in developing and emerging countries.	Added in this text into the section as an example of industry wide increase doesn't necessarily cause global problems. Problems can be highly localized.
Marieke Sassen	Ch.3	52	1711	52	1713	I would suggest saying something about other countries e.g. DRC where the implications of mining of Cobalt, Coltan and other minerals are likely growing but hard to assess due to inaccessibility, which then links to an important underlying driver for the impacts of extractive industries, which needs to be addressed in this section: governance and the presence of conflict, powerful industry influence etc.	We tried to address this, however it was very hard to find literature on this particular topic and assessing national policies was beyond the scope of this chapter
Finnish Government	Ch. 3	52	1717	52	1717	ore grade	Changed
Marieke Sassen	Ch.3	52	1717	52	1718	Address repetition with 1688-1689	Changed
Finnish Government	Ch. 3	53	1736	53	1736	.. Industries require specific metals, such as lithium, gallium, cobalt, niobium,	Changed
Finnish Government	Ch. 3	53	1742	53	1742	mining industries	Changed
Finnish Government	Ch. 3	53	1744	53	1744	especially for rare earth elements and	Changed
Marieke Sassen	Ch.3	53	1750	53	1752	Delete "While the [...] roads" (repetition line 1969-1698)	Changed
Finnish Government	Ch. 3	54	1764	54	1764	rare earth elements	Changed
Finnish Government	Ch. 3	54	1769	54	1769	diverse array of metals, minerals and fossil fuels. Meaning of the "with many of the fastest"?	Clarified
Shenggong Li	Ch.3	54	1770	54	1771	An introduction is needed for section 3.4.8	The introductory paragraph in the revised table of contents no longer has a numbered introduction
Marieke Sassen	Ch.3	55	1771	55	1771	Title 3.4.8. missing	Title 3.4.8 is now 3.3.6
Shihai LV	Ch.3	55	1771	55	1771	Add "3.4.8 Infrastructure, industrialdevelopment and urbanization"	Title has been added and is now 3.3.6
Zhao Gengxing	Ch.3	55	1771			Here missed the title of "3.4.8"	Title has been added and is now 3.3.6
Finnish Government	Ch. 3	55	1772	55	1773	Urbanization is a gradual increase in people living in cities and towns in relation to rural people!	Change has been made to the definition.
Germany	Ch.3	55	1782	55	1782	"LDR" needs to be spelt out.	LDR was fully spelled out throughout.

Marieke Sassen	Ch.3	55	1782	55	1782	It says that soil sealing is one of the most severe forms of LDR, assuming LDR stands for Land Degradation and Restoration, I am sure this is mean differently as soil sealing surely is not a form of restoration. Please rephrase.	This was rephrased to state the soil sealing is one of the most severe forms of land degradation.
Marieke Sassen	Ch.3	55	1784	55	1784	Address use of LDR as above	All acronyms in this section were spelled out and corrected.
Katalin Török	Ch.3	55	1784			Prokop et al 2011 missing from the litr	Prokop was added.
Marieke Sassen	Ch.3	55	1785	55	1786	"here we use built-up areas as an index of IU extent": It is a little bit confusing because fig 3.13 has both Impervious Surface and Built-up area, which both involve soil sealing. Please clarify the definitions so that it is clear why you only use Built-up area as an index in the rest of the text. (I imagine Imp. urface also includes natural surfaces incl. rock etc)	We have removed the sentence "here we use built-up areas" and now evaluate the hierarchical framework presented in Liu et al. (2014) to describe urban area, built-up areas, and impervious surfaces
Marieke Sassen	Ch.3	55	1791	55	1791	Clarify definitions	All definitions are now part of the Glossary
Katalin Török	Ch.3	55	1793		1794	Elvidge et al. 2012	Reference was added. Thank you.
Katalin Török	Ch.3	56	1802			Potere et al. 2009	Reference was added. Thank you.
Katalin Török	Ch.3	56	1828			Ewing 2008 missing from the litr	Reference was added. Thank you.
Katalin Török	Ch.3	56	1830			Seto et al. 2011	Reference was added. Thank you.
Marieke Sassen	Ch.3	56	1832	56	1832	Please also note active government policies to move people to urban centres or near infrastructure (e.g. China relocating large numbers of rural people into urban centres (see http://www.nytimes.com/2013/06/16/world/asia/chinas-great-uprooting-moving-250-million-into-cities.html?pagewanted=all&_r=0))	Estimates of the continued urban to rural migration are now included for China over the next 15 years.
Katalin Török	Ch.3	56	1837			Angel, Sheppard, & Civco, 2011	Reference was added. Thank you.
Katalin Török	Ch.3	56	1840			Angel, Sheppard, & Civco, 2011	Reference was added. Thank you.
Katalin Török	Ch.3	57	1852			Angel, Sheppard, & Civco, 2011	Reference was added. Thank you.
Marieke Sassen	Ch.3	57	1857	57	1857	"contain a higher share": it implies that in developing countries the % built-up is higher than in developed countries. Is that so? If not then please clarify and add percentages.	This sentence was removed in the final report.
Katalin Török	Ch.3	57	1862			Angel, Sheppard, & Civco, 2011	Reference was added. Thank you.
Katalin Török	Ch.3	57	1867			Missing from litr: Angel et al. 2010/ or = wrong year?	Year correct. Reference added
Katalin Török	Ch.3	57	1872			van Asselen & Verburg 2013 Missing from litr	Reference was added. Thank you.
Marieke Sassen	Ch.3	58	1877	58	1877	Wrong fig number, fig 3.13 is in section 3.4.8.1	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Finnish Government	Ch. 3	58	1884			Bren d'Amour et al. 2015 not found in the reference list. Therefore, the statement of cropland loss remains a bit vague. Abandoning may result in spontaneous ecosystem recovery (former farmer moved to urban areas) . It is the the consequent land use of the former fields that determine the impact to land degradation/biodiversity values.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Katalin Török	Ch.3	58	1884			Bren d'Amour et al. 2016 Missing from the litr	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Gunay Erpul	Ch.3	58	1885	58	1890	Nutrient insufficiency in soil contributes to food insecurity (nutrient imbalance in soil as a driver of soil degradation, a negative nutrient balance). The need for better soil and nutrient management.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Gunay Erpul	Ch.3	58	1891	58	1915	Agricultural expansion, mechanization (intensively tilled clayey soil) of land management and soil compaction: the major cause of compaction is pressure on the soil from heavy machinery. It is more serious in forested regions where land clearing (and even other cultivation activities) cannot be done without mechanization. Compaction caused by overgrazing (also increase in livestock), degrading soil ecosystem services.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Astrid Hilgers	Ch. 3	58	1891	58	1891	This section does not seem to be about interactions among drivers but partly repeats view points mentioned before, such as in lines 1907-1915.	Agreed. This is the reason we chose to delete this section.
Zhao Gengxing	Ch.3	58	1891	58	1915	There should have more explanation of the influences of Deforestation and Agricultural Expansion on land degradation.	This information is now found in both Croplands, Grazing Lands, and Forest Management sections.
Germany	Ch.3	58	1892	58	1893	The sentence surely holds true, however it is also "a" or "the" key driver in other parts of the world, namely Africa and Asia.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Germany	Ch.3	58	1893	58	1895	The sentence needs a clearer message. If "forest products are harvested and then allowed to regenerate" the process is generally called sustainable forest management and of course this does not lead to land degradation. So it is not clear what kind of management practices the authors are referring to.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.

Finnish Government	Ch. 3	58	1893	58	1898	Not easy to catch the point of the two last sentences of the paragraph. Forest regeneration cutting is less severe than forest transformation to cropland and grazing land. Less/more severe to what? In which terms. The forests of Central and South America converted to pastures? Are they still forests / wood lands?	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Finnish Government	Ch. 3	58	1902	58	1902	Natural grazing system? Definition.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Finnish Government	Ch. 3	58	1904	58	1904	Pasture? Definition. Different from natural grazing land? Presented here as a result of deforestation i.e. cannot be a forest.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Marieke Sassen	Ch.3	58	1907	58	1915	from "Such... this is the same text as lines 1053-1061 on p35. Please choose the most appropriate place	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Eila Gendig	Ch. 3	58	1909		1915	Covered already earlier in the chapter	Agreed. This is the reason we chose to delete this section.
David Le Maitre	Ch.3	59	1917	59	1924	This introductory paragraph should mention rangeland overgrazing/browsing generating disturbance regimes that favour invasions, often coupled with the introduction of species seen as being necessary for land restoration (but actually becoming a significant adverse impacts on their own). The topic is discussed later (line 1953) but is important enough to be mentioned up front.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Katalin Török	Ch.3	59	1920		1921	citation format	All citations were formatted correctly in the FGD
Marieke Sassen	Ch.3	59	1921	59	1924	Integrate with previous sentence to remove repetition	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Finnish Government	Ch. 3	59	1934	59	1936	Pinus-species, which..., belong to the most widely used non indigenous genus for plantations (refs) are amongst the most problematic...	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Germany	Ch.3	59	1935	59	1937	Line 1936: "is amongst the most problematic [...]" --> sentence is incomplete / does not make sense.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Shenggong Li	Ch.3	59	1940	59	1943	What are the remaining 8% of species	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Katalin Török	Ch.3	59	1940			Stanturf et al. 2013	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Marieke Sassen	Ch.3	59	1943	59	1943	"food": how? The other causes are actions, this is not so need to clarify.	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
David Le Maitre	Ch.3	59	1945	59	1952	In developing countries subsistence cropping and then abandonment is a significant cause of soil erosion and loss and may facilitate invasions	This section did not go forward into the final draft. The text from the SOD has gone back to specific direct drivers.
Germany	Ch.3	59	1946	59	1946	Line 1946: "invasion is almost assured [...]" --> well, invasion depends on many things, so "almost assured" sounds a bit exaggerated, maybe replace with something like "very likely".	Changed
Marieke Sassen	Ch.3	59	1948	59	1948	"favors annual plants": please clarify that this is a problem when they are non-native as there are also native annuals that will be favored.	This sentence is no longer in the FGD.
Germany	Ch.3	60	1966	60	1972	Figure 3.13: --> The source of the figure is missing. Not very clear to me what the figure tells us about invasive species, maybe add a sentence to explain its meaning for invasive species.	This figure has been removed.
Shenggong Li	Ch.3	60	1967	60	1967	Figure 3.13 - There is no definition for Extrind and Inf-ind-Urb	This figure has been removed.
Marieke Sassen	Ch.3	60	1968	60		Wrong fig number, fig 3.13 is in section 3.4.8.1 Should be 3.14	This section has been removed.
Cantele, Matthew	Ch. 3	60	1968			I find figure 3.13 hard to follow	This figure has been removed.
Shihai LV	Ch.3	61	1973	67	2208	Figure 3.14 → Figure 3.15, Figure 3.15 → Figure 3.16, Figure 3.16 → Figure 3.17, Figure 3.17 → Figure 3.18	We were not sure about the nature of this comment. But all the sequencing of Figures has been checked in the final draft.
Zhao Gengxing	Ch.3	61	1973	61	1982	The title of the Figure 3.14 and 3.15 should be put below the figures	Changed.
Katalin Török	Ch.3	61	1973		1981	Location of Fig. Captions should be under the Fig.	Changed.
Germany	Ch.3	62	1983	62	1983	in Chapter 3.6. a general remark should be added: Due to the fact that each species reacts differently to climate change, a severe impact of climate change on biodiversity is the change in biological interactions (predator-prey relationships, symbiosis, food plant - herbivory interactions, pollination etc.). Different species-specific responses to climate change may lead to de-synchronisation of biological interactions.	We now point out the differences in the way species react and move in response to climate change can result in spatial and temporal mismatches between interacting species and the disruption of key existing ecological interactions, e.g. plant-pollinator interactions

David Le Maitre	Ch.3	62	1983		onwards	A significant factor that, to my mind, is not stated clearly enough is the increased temporal variability in climate, notably rainfall and temperature on a range of spatial and temporal scales interacting with the more general trends and other drivers. From an ecological perspective it is this variability (which includes extreme events) which is likely to exceed levels recorded for the Holocene if not longer.	We now point out that increases in inter-annual temperature variability, which has been documented in some places, e.g. western Europe, can have significant ecological impacts. We have not discussed increases in temperature variability at a global level in detail as there is substantial debate about whether variability of global temperatures per se is in fact increasing (Huntingford et al. 2013, Alexander & Perkins 2013; Vincze et al. 2017). We do also mention that inter-annual variability in rainfall can have important consequences for ecological processes as well as for human populations. We discuss the importance of extreme events in a separate section.
Katalin Török	Ch.3	62	1993			Vitousek et al. 1997	Citations were standardized in final rendition of the text.
Eila Gendig	Ch. 3	62	2006	63	2027	High altitude ecosystems are also under major threat from climate change driven temperature increases, when movement to even higher/colder altitudes is not possible.	We now mention the disproportionate risks faced by high-elevation range restricted species.
Katalin Török	Ch.3	62	2008		2015	citation formats	Citations were standardized in final rendition of the text.
David Le Maitre	Ch.3	62	2014	62	2022	Many papers have been published which suggest increased extinctions but they must not be overplayed. The models themselves often: (a) use problematic assumptions about the sensitivity of species to, for example, temperature which may lead to overstating the case; (b) do not incorporate even basic ecophysiological processes so interactions between climatic factors cannot be captured; and (c) largely ignore the role of biotic interactions in determining species distributions. This review should avoid overstating these risks.	We now qualify this discussion by pointing out the limitations of extinction risk models.
Katalin Török	Ch.3	62	2021		2024	Colwell et al. 2008, Stocker et al. 2013	Citations were standardized in final rendition of the text.
Marieke Sassen	Ch.3	63	2026	63	2026	Give an example of these implications	We now provide examples of the potential consequences of warming at high latitudes for the biota and human communities in the region.
Cantele, Matthew	Ch. 3	63	2028			Include potential positive feedbacks and tipping points (permafrost methane release and warming potential)	Due to length restrictions we are unable to discuss this in much detail in this chapter, which focuses primarily on the status and trends of the drivers of land degradation. Although processes are briefly touched upon here, they are discussed in depth in Chapter 4. This section has been considerably shortened now.
U.S. government	Ch.3	63	2028	63	2047	A specific threat in central Asia is glacial lake outburst floods (GLOF) due to seismic activity as a trigger	This is indeed an important threat. Although we briefly touch upon natural direct drivers such as seismic activity at the start, our focus in this chapter is primarily on anthropogenic direct drivers. Also, this text on processes has now been considerably shortened.
Katalin Török	Ch.3	63	2033		2037	citation formats	Citations were standardized in final rendition of the text.
Katalin Török	Ch.3	63	2040			Marchenko, Gorbunov & Romanovsky 2007	Citations were standardized in final rendition of the text.
Germany	Ch.3	63	2042	63	2043	It is not clear, why "grassland deterioration" is mentioned explicitly besides "land degradation" and "desertification"? Isn't "grassland deterioration" a feature of land degradation/desertification? Please expand on this if it is not the case.	We thank the reviewer for pointing this out. Indeed desertification and deterioration are cases of land degradation. However, this text, which largely dealt with degradation processes has now been considerably shortened. Degradation processes are dealt with in more detail in Chapter 4
Marieke Sassen	Ch.3	64	2054	64	2054	"Precipitation patterns have deviated": specify since when	We now state that precipitation patterns have been deviating since the early to mid-1900s
Katalin Török	Ch.3	64	2061			Wright et al. 1999	Citations were standardized in final rendition of the text.
Marieke Sassen	Ch.3	64	2073	64	2073	"serve as degradation driver": rephrase to "lead to degradation"	We have now reworded the sentence as suggested.
Katalin Török	Ch.3	64	2074			Archer, 2009	Citations were standardized in final rendition of the text.
Katalin Török	Ch.3	64	2078			Brawn et al. 2016	Citations were standardized in final rendition of the text.

Astrid Hilgers	Ch. 3	64	2082	64	2129	This text does not say much on the effect of extreme events on agricultural production. May be there is not (yet) enough evidence but the possibility that the increase of extreme events in the future may jeopardize the necessary yield increase is worth noting. Also that areas that are now at the boundary for producing crops may change into areas where crop production will not be feasible any more.	We do point out that extreme events including heavy rainfall and droughts can affect crop yields and productivity, but due to length restrictions, we are not able to discuss this in much detail. We have now included a sentence in the earlier section on rainfall pointing out that directional reductions in rainfall can render some areas unsuitable for agriculture in the future.
Katalin Török	Ch.3	64	2090			Jentsch et al. 2009	Citations were standardized in final rendition of the text.
David Le Maitre	Ch.3	65	2103	65	2115	Although there is less literature available, extremes of droughts are also likely to have significant impacts on semi-arid to desert environments and ecosystems as well and this should at least be mentioned	We have now modified the text to also mention that droughts can impact vegetation production and survival even in arid and semi-arid systems
Katalin Török	Ch.3	65	2105			Lewis et al. 2011	Citations were standardized in final rendition of the text.
Katalin Török	Ch.3	65	2115			D'Odorico et al. 2013	Citations were standardized in final rendition of the text.
Gunay Erpul	Ch.3	65	2116	65	2129	The role of the soil organic carbon on the impact of climate extremes on soils and crops can be mentioned in reference to regulating water supply to plants, reducing erosion through runoff decrease, and providing sites for nutrient retention and release	Due to length restrictions we are unable to discuss this in much detail in this chapter, which focuses primarily on the status and trends of the drivers of land degradation. Although processes are briefly touched upon here, they are discussed in depth in Chapter 4.
Gunay Erpul	Ch.3	65	2116	65	2129	Interaction btw soil degradation and human settlements in terms of extreme events (Soil degradation affects climate regulation and also entails biodiversity and soil resilience loss and an increased vulnerability of human settlements to natural disturbances and extreme weather events).	Given the focus of the chapter, i.e. status and trends of drivers, we do not discuss processes (i.e. soil degradation) in much detail. They are discussed in depth in Chapter 4.
Katalin Török	Ch.3	65	2118			Ravi et al. 2010	Citations were standardized in final rendition of the text.
Katalin Török	Ch.3	65	2124			Michener et al. 1997	Citations were standardized in final rendition of the text.
Virginia Meléndez Ramírez	3	65	2129	65	2129	Another problem is the deforestation in the coasts which causes that the hurricanes have greater intensity when it enters to earth.	We agree that this can be important. However, due to length restrictions we are unable to discuss all potential impacts in this chapter (impacts are discussed in more detail in chapter 4). This section has also now been shortened considerably.
Katalin Török	Ch.3	65	2131		2135	it might be good to mention that we are over the safe planetary boundary on N cycling changes caused by global change / or linked to 2165-2169 (Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., ... & Folke, C. (2015). Planetary boundaries: Guiding human development on a changing planet. Science, 347(6223), 1259855)	We have now included a statement on the exceeding the planetary boundaries for biogeochemical flows of N and P.
Germany	Ch.3	65	2138	65	2142	Include a box or a footnote that briefly explains the difference between C3- and C4-plants.	We have now included a box that explains the difference between c3 and c4 plants
Finnish Government	Ch. 3	65	2139	65	1936	C3 plants are shrubs and trees and herbs and grasses! Most of the plants, only 4% of terrestrial species are c4.	This has now been clarified. We clearly state that most plant species are C3, and although C4 species comprise ~4% of plants, they nevertheless dominate in tropical savannas and grasslands which cover about 30% of the Earth's surface.
Shenggong Li	Ch.3	65	2141	65	2142	"CO2 fertilization can thus favor shrubs and trees over grasses, leading to woody encroachment in ecosystems" This is likely not true since in arid and semi-arid areas as well as elsewhere, droughts due to changed rainfall regimes are main drivers for shrub and woody plant encroachment.	While the factors driving woody encroachment are varied, multiple studies have highlighted the role of CO2 fertilization as one of the likely causes, amongst others. We clearly state that it is one of the likely causes, while also pointing out the role of altered rainfall regimes as a driver in this paragraph.
Katalin Török	Ch.3	66	2144		2147	Buitenwerf et al. 2012 and Trollope et al. 1989	Citations were standardized in final rendition of the text.
David Le Maitre	Ch.3	66	2146	66	2156	Reference should be made to the papers by Midgley and Bond 2015 Nature Climate Change 5: 823-829 and Stevens et al Phil Trans Roy Soc B 2016 371.	We have now included these references
Germany	Ch.3	66	2155	62	2155	Concerning changes in energy cycling, a change in albedo through bush encroachment should be mentioned explicitly because of its effect to further increase climate change.	We now mention that bush encroachment can alter albedo with attendant feedback effects to the climate system.

Gunay Erpul	Ch.3	66	2157	66	2169	Human-induced acidification of agricultural soils is primarily associated with product removal or increases of nitrogen (N) and sulfur (S) inputs (e.g. legume pastures, fertilizer inputs, atmospheric deposition). Acidification due to more stringent regulations on atmospheric emissions from industry. Acidification due to acid rain.	Due to length restrictions we are unable to discuss this in much detail in this chapter. Land degradation processes are only briefly touched upon here and are discussed in depth in Chapter 4.
Katalin Török	Ch.3	66	2160			Maskell et al. 2010; Stevens et al. 2004	Citations were standardized in final rendition of the text.
NFP of China	chapter 3	66	2161	66	2165	The problem does not meet the actual situation in China. China has a lot of relevant research data. we recommend to delete the example of China	We have reworded the statement, and now only mention eastern and southern Asia in general where data are still lacking from many countries.
Katalin Török	Ch.3	66	2172			Gonzalez et al. 2010	Citations were standardized in final rendition of the text.
Germany	Ch.3	66	2178	66	2178	The inclusion of the definition of "novel climates" is highly appreciated.	Thank you.
Shenggong LI	Ch.3	66	2185	68	2250	Here it should be stressed that combination of different climate change factors may either multiply or offset the degradation drivers depending on the cases.	This is now stated in the last paragraph
Australia NFP	Ch.3	67	2211	68	2226	Please fact check and revise the statements at the lines highlighted below: Fact check lines 2213 - 2214: fire seasons have increased in length recently in parts of Australia – particularly southern parts. Lines 2215 - 2223: The change in fire weather can also reduce the time available for prescribed burning to fight fire – and this is also occurring in some parts of Australia and the world.	There are indeed regional variations across Australia (and the other continents) which was not clearly brought out in the original text. Due to length restrictions, we are unable to discuss regional/ continental patterns in much detail, and so we have removed the text on continental patterns and only report global statistics now. We do appreciate the comment on how changing fire season lengths can limit the utility of prescribed burning as a fire-fighting tool. We have now included a sentence to this effect.
Katalin Török	Ch.3	68	2229			Hellmann et al. 2010	Citations were standardized in final rendition of the text.
NFP of China	chapter 3	68	2232	68	2236	This view is one-sided, we recommend to delete the example	It is not immediately obvious to us why this statement is one-sided. We have however rephrased the statement to state that temperatures increases have been linked to increases in invasion rates on 3 continents.
Katalin Török	Ch.3	68	2239		2040	Kriticos et al. 2003, Ziska et al. 2011	Citations were standardized in final rendition of the text.
Katalin Török	Ch.3	68	2248			Seddon et al. 2016	Citations were standardized in final rendition of the text.
Javier Ernesto Cortés Suárez	Ch.3	69	2251	69	2252	The priorities for research should also be focused on fund access for this kind of research, as well as the lessons learned about what to do a not to do in order to access to such funds.	A sentence about communicating research priorities to funding agencies on drivers of land degradation and restoration was added to this section.
Virginia Meléndez Ramírez	3	69	2251	69	2251	Here you could make a box to indicate the most important priorities.	This is a very short section to highlight some of the research needs but due to space limitations we cannot justify an additional box on research priorities.
Marieke Sassen	Ch.3	69	2251	70	2334	Add justification for why these are priorities. How will better understanding of how indirect drivers interact and lead to particular outcomes and of the direct drivers of LD help? What will it help and whom? Put in broader context. For example the development, planning, implementation and monitoring and evaluation (including to track progress against a whole suite of internationally agreed targets) of restoration policies and actions. If this is not already discussed elsewhere in the report.	The development, planning, implementation and monitoring is addressed in Chapter 6. We provide this short section specific to research needs related to direct and indirect drivers.
Steve Prince	Ch. 3		2253		2253	The nature of the drivers is complex and multifaceted, true, but so also is "degradation" itself. A general assumption in the LDRA is that there is one phenomenon of "degradation". But there are virtually no similarities between, say, increased fire in boreal forests and dust generation in arid croplands - except the causes are partly a result of human actions (again, of many sorts and motivations). Prince 2015 makes this point (Prince, S. D. (2016). Where does desertification occur? Mapping dryland degradation at regional to global scales. In R. Behnke & M. Mortimore (Eds.), In The End of Desertification? Disputing Environmental Change in the Drylands. Springer-Praxis Earth System Science Series.)	We understand the comment but we are not quite sure how to change the text or respond or whether the reviewer would like us to make changes to the text.
Zhao Gengxing	Ch.3	69	2257	70	2293	There should further clarify the priorities for research on the indirect drivers.	Given space limitations it is not possible to provide a lengthier description of priorities for research on indirect drivers

						Is the IMAGE model an approach to this? And what about dynamic modeling such as agent-based models?	Agent based models are included in the LUC approaches reviewed by the citations listed. The IMAGE model is one specific modelling framework that has some advantages but is far from free of the limitations discussed here
Steve Prince	Ch. 3		2269		2269		
Katalin Török	Ch.3	69	2271			Dalla-Nora et al. 2014	Dalla-Nora et al. 2014 is in the references cited here.
Steve Prince	Ch. 3		2274		2274	...underlying human drivers.. to make a clear distinction with biophysical drivers?	"anthropogenic drivers" added here
						This an unfortunate name. "Counterfactual" means, literally, against the facts. I could live with metafactual = beyond the facts which would be clear and avoid the mystique associated with a novel term that is not self-explanatory. Having looked into this term in relation to Ch.2's use of "counterfactuals" for baselines (see 3 citations below and 9 others in Ch.2, lines 547-565 that I have read), I can only conclude it is either a guess about the past or a site that is subjectively identified as in the before-treatment condition. The ONLY relevant example of a real application I can find is in a non-peer-reviewed report, which simply uses any forest that is >100 years old as its conterfactual - no different from before-after comparison. I understand the concept takes into account factors that may have caused degradation in addition to those found in a simple protected v degraded area comparison, but does this really need an obscure term, mainly used in psychology? Maybe I am wrong. At least it must be admitted that it is far from widely known or used and therefore, if mentioned at all, could be adequately covered by a note in brackets with a citation? Ferraro, P. J. (2009). Counterfactual thinking and impact evaluation in environmental policy. <i>New Directions for Evaluation</i> , 2009(122), 75–84. https://doi.org/10.1002/ev.297 . Liu, Lisa Garbern. "Reasoning counterfactually in Chinese: Are there any obstacles?." <i>Cognition</i> 21.3 (1985): 239-270. Ferraro, P. J., & Pressey, R. L. (2015). Measuring the difference made by conservation initiatives: protected areas and their environmental and social impacts. <i>Philosophical Transactions of the Royal Society of London B: Biological Sciences</i> , 370(1681). Retrieved from http://rspb.royalsocietypublishing.org/content/370/1681/20140270 . Holland 1986 (have seen the abstract only) - it is about statistical theory and techniques.	See http://dx.doi.org/10.1080/1747423X.2015.1117530 for a discussion. Since Holland 1986, "counterfactual" is indeed extremely widely used in statistics but also way beyond in experimental research; even if people don't know it.... It is the basic way to explore "potential outcomes" in the Rubin Causal Model, see https://en.wikipedia.org/wiki/Rubin_causal_model . Etymologically, "counter"-factual comes from the idea that, let's say that we first observe what is the outcome in the presence of factor X. The causal effect of factor X is the difference between this and what is the outcome in the absence of factor X (so, = "against" the fact of the presence of X). We have added additional text to explain this, and included a number of the classic citations by Ferraro and colleagues.
Steve Prince	Ch. 3		2283		2287		
Shenggong Li	Ch.3	69	2286	69	2286	" all of which being widely used in "-->" all of which are widely used in "	Change made
Steve Prince	Ch. 3		2287		2287	and space-for-time substitution (see Ch.4 lines 505-9)	Change made
Steve Prince	Ch. 3		2287		2287	Meta-analyses review many studies of the matter of interest and try to derive generalities. It is not a practical technique, any more than being clever!	The power of meta-analyses is in fact deriving generalities from what is often more local scale conditions. We have left that in the list as one of several approaches to deriving causal pathways.
Zhao Gengxing	Ch.3	70	2294			"3.7.1" should be "3.7.2"	Change made
David Le Maitre	Ch.3	70	2298		onwards	An aspect of land degradation that is particularly poorly documented is the shift of species composition that indicates the initial stages. An example is rangelands where there can be a shift from highly palatable to unpalatable species (e.g. grasses, shrubs) with no change in the cover. This makes detection using remote sensing generally problematic unless there is a concomitant shift in reflectance (albedo) for example when woody species replace grasses. Such shifts pervade rangelens worldwide nd need to be better understood because the impacts on human livelihoods are substantial.	This is a very short section to highlight some of the research priorities, and there is insufficient space to give a comprehensive review of all research priorities in this huge field
James Gambiza	Ch. 3	70	2298	70	2299	The authors refer to lack of degradation indicators. They should look at Orr et al.'s (2017) proposed global indicators of land degradation. Orr et al. (2017) have proposed land cover change, net primary production (as measured using NDVI) and soil organic carbon as the indicators that should be used to assess land degradation.	The reference to Orr 2017 and the global biophysical indicators is now included.
Steve Prince	Ch. 3		2301		2302	This is a popular misconception about remote sensing. On the one hand sub-meter data are becoming accessible to researchers and managers, and on the other hand, no one imagines remote sensing can replace other types of measurement. It is just an additional tool, like population data, has added to assessment of field plots. Of course there are complementaries, but not entirely.	The point here is that global scale assessment of land scale must rely on remote sensing products and there are still challenges with agreement between field based ground truthing measures and remote sensing output. Agreed that the resolution of remote sensing products are becoming increasingly accessible.

Steve Prince	Ch. 3		2305		2307	Could be more positive - advances are being made..... For example I have published the errors on AVHRR derived NDVI data (Nagol, J. R., Vermote, E. F., & Prince, S. D. (2014). Quantification of Impact of Orbital Drift on Inter-Annual Trends in AVHRR NDVI Data. Remote Sensing, 6(7), 6680. http://doi.org/10.3390/rs6076680)	A sentence was added here on the increasing availability of high resolution spatial data and use of advanced statistical approaches to evaluating uncertainty in spatial data.
Suneetha Mazhenchery Subramanian	Ch. 3	70	2311			a key area not addressed here is the need for more transdisciplinary research involving non-scientific stakeholders in generating data, monitoring trends and identifying solutions.	This point was added.
Nathalie van Haren	Ch.3	70	2314	70	2314	In other chapters, pesticides are specified by herbicides, pesticides and fungicides	Agreed, we use the broad term "pesticide" in this sentence to denote the use of anything that kills a pest which includes weeds, insects, and fungal pathogens.
UNCCD SPI	Ch.3	70	2314	70	2314	In other chapters, pesticides are specified by herbicides, pesticides and fungicides	Agreed, we use the broad term "pesticide" in this sentence to denote the use of anything that kills a pest which includes weeds, insects, and fungal pathogens.
Steve Prince	Ch. 3		2315		2317	Yes.... and a critical need is the establishment of monitoring programs. For consistency, an international program will have to be created (e.g.. with FAO, UNEP). Also, owing to the scales involved, remote sensing with its ever-expanding capabilities would be a major component.	We agree on this point and make the point earlier that the LDN framework and indicators may be a good start.
Steve Prince	Ch. 3		2322		2322	Cite Ch. 4 on this (sect 4.1.2.1 and 2).	A reference to Chapter 4 was added.
Katalin Török	Ch.3	71	2355			date of paper 2030	All references were thoroughly proofread in the FGD.
Katalin Török	Ch.3	89	3305			spelling (??)	All references were thoroughly proofread in the FGD.
Katalin Török	Ch.3	91	3405			Author name: Mueller?	All references were thoroughly proofread in the FGD.
Katalin Török	Ch.3	91	3466			Journal missing	All references were thoroughly proofread in the FGD.