

REGIONAL ASSESSMENT REPORT ON BIODIVERSITY AND ECOSYSTEM SERVICES FOR EUROPE AND CENTRAL ASIA							
Comments external review first order draft - Chapter 4							
Reviewer Name	Chapter	From Page	From Line	To Page	To Line	Comment	Response
Frank Wugt Larsen (EEA input)	General	General	0			General: our 'light' review has focused on relevant information hosted by the European Environment Agency (EEA) for which we believe a consultation by authors could improve the ECA report. We have also provided some specific comments to issues we spotted (please note that this has not been done systematically given the length of the report). In general, we will also refer to the EEA/ETC BD document 'Information note to IPBES secretariat on EEA and EU information' ( <a href="http://bd.eionet.europa.eu/Reports/ETCBTechnicalWorkingpapers/PDF/Information_IPBES_on_EEA_EU.pdf">http://bd.eionet.europa.eu/Reports/ETCBTechnicalWorkingpapers/PDF/Information_IPBES_on_EEA_EU.pdf</a> ), which was shared with the ECA TSU in 2015. Several reports provide a good starting point to find relevant information, incl. EEA, 2015 European environment — state and outlook 2015 (SOER 2015 ( <a href="http://www.eea.europa.eu/soer/">http://www.eea.europa.eu/soer/</a> )), in particular, thematic briefings ( <a href="http://www.eea.europa.eu/soer-2015/europe">http://www.eea.europa.eu/soer-2015/europe</a> ) and SOER synthesis ( <a href="http://www.eea.europa.eu/soer#tab=synthesis-report">http://www.eea.europa.eu/soer#tab=synthesis-report</a> ); EEA 2016. Mapping and assessing the condition of Europe's ecosystems. Progress and challenges ( <a href="http://www.eea.europa.eu/publications/mapping-europes-ecosystems">http://www.eea.europa.eu/publications/mapping-europes-ecosystems</a> ); EEA, 2015. State of Nature Report 2015 ( <a href="http://www.eea.europa.eu/publications/state-of-nature-in-the-eu">http://www.eea.europa.eu/publications/state-of-nature-in-the-eu</a> ); EEA, 2015. State of Europe's Seas ( <a href="http://www.eea.europa.eu/publications/state-of-europes-seas">http://www.eea.europa.eu/publications/state-of-europes-seas</a> ); EEA, 2016. European forest ecosystems – state and trends ( <a href="http://www.eea.europa.eu/publications/european-forest-ecosystems">http://www.eea.europa.eu/publications/european-forest-ecosystems</a> ). In general, the EEA website ( <a href="http://www.eea.europa.eu">http://www.eea.europa.eu</a> ) also provides access to a wealth of relevant indicators and assessments.	The ECA authors have been encouraged to use EEA reports as a resources, and we would like to thank the reviewer for providing the web links for these.
Frank Wugt Larsen (EEA input)	General	General	0			General: There seems to be quite some redundancy between the chapters. Additionally different data sources seem sometimes to be used in the redundant parts which may create more confusion than clarification leading to different partly biased messages. We assume the coherence and consistency of chapters will be dealt with in the next draft and haven't provided specific comments on this.	Agreed. We are aware of the overlap between chapters and this has been addressed in subsequent drafts
Frank Wugt Larsen (EEA input)	General	General	0			General: In general, there is a need to systematically check references in the chapters. References are cited in text but don't appear in reference lists, and references are missing in some graphs and in text etc. Specifically, EEA reports are not referenced consistently, e.g. sometime sit is EEA 2015, other times European Environment Agency 2015.	Agreed. The references were thoroughly checked in subsequent drafts and the author team has been encouraged to systematically use the Mendeley reference management software.
Thomas Brooks (IUCN)	General	0	0			Congratulations to the authors for all their hard work in producing this FOD.	Thank you
Thomas Brooks (IUCN)	General	0	0			If it would be useful to the authors for IUCN to disaggregate further the Red List data summarised for the ECA region and its component subregions by Brooks et al. (2016), please feel free to contact me accordingly. Examples of potentially useful disaggregation could include by marine/freshwater/terrestrial, by major systems (and sub-systems) aligned to the headings in Section 3.3.2, species groups aligned to the headings in Section 3.3.3, or drivers aligned to the headings in Section 4.3.	Thanks and these data have been made available to subsequent drafts of the ECA assessment
Thomas Brooks (IUCN)	General	0	0			IPBES follows the CBD definition of biodiversity, which encompasses diversity at genetic, species, and ecosystem levels. It is therefore redundant to say "biodiversity and ecosystems". Either replace with "genetic, species, and ecosystem diversity", or simply say "biodiversity". Same applies any other places this formulation is used throughout (eg Chapter 1 L146, L159, L164, L170, L788, L796; Chapter 2 L300, L1843-1844; Chapter 3 L461, L468, L472, L528, L635, L1018, L3305, L3307, L3317, L3323, L3340, L3738; Chapter 4 L265, L430, L4418; Chapter 5 L142-143, L144, L824, L846, L913, L1590, L1979, L1982, L1985).	The ECA assessment is based fundamentally on the IPBES conceptual framework. The conceptual framework refers to biodiversity and ecosystems in the 'Nature' box.
Douglas Nakashima	General	0	0			GENERAL: on incorporation of ILK as an actual source of knowledge: The way incorporation of ILK is recommended in the sections so far allows to address the question of indigenous and local people as a component of socio-ecological systems where humans and nature interact, where societies use nature, perceive it, invest it culturally etc... However, incorporation of ILK as an actual source of knowledge about biodiversity and ecosystems changes has not been fully developed in the FOD yet; although it is presented as a recommendation and announced in the 1st chapter. The involvement of indigenous and local people and ILK in scientific assessments and international organizations represents a political statement, and contributes to the recognition of indigenous people especially, as legitimate actors in decision making, in the context of natural resource management for example. However, incorporation of ILK is not only a political statement, but also represents a valuable source of knowledge. It is by taking seriously the value of this knowledge that incorporation of indigenous and local people can represent more than a superficial recognition. Published scientific literature represents a source of access to ILK. In this review, examples will be given of studies where ILK related to biodiversity and environmental change has been recorded. It can be factual qualitative observations made by local populations regarding components of the environment and the changes they observe, observations of the drivers of these changes, or narratives or stories embedded in personal history and local worldview illustrating the changes that occurred in the environment along one's lifetime or across generations. These observations can be added as a complementary source of information to scientific studies. They can corroborate scientific observations, but also complement them, contradict them, often operating at different time and space scales. It is to be noted that extraction of fragments of ILK to be incorporated to the different sections of such an assessment can be problematic, notably for the integrity of the knowledge which is outrooted from its context. (see comment line 8 of this table). SEE Nakashima & Roué 2002	Since the FOD, the author team has received the completed proceedings of the workshop with ILKP holders. Information within the proceedings has been included as much as possible within the SOD, although time constraints (the final workshop proceedings were only received 1 week before the SOD submission deadline) limited this task.
Douglas Nakashima	General	0	0			4.6.1.1. ECA in general Parrotta & Agnoletti 2007. (p1-2) "The holders and users of traditional knowledge in many parts of the world face significant challenges - continuing encroachment and/or expropriation of their lands, degradation of their forests, and the erosion of their cultures, values, and traditional lifestyles. In many developed societies, technological development, the abandonment of marginal lands, renaturalization, and inappropriate policies are rapidly erasing cultural values and contributing to the globalization of landscape, which are being simplified into areas either managed for commercial exploitation or left to natural succession." (p2) "This trend has been supported by the historical development of forestry, particularly in Europe. Since the early 19th century, the development of modern forestry promoted industrial plantations favoring species suited for timber production, as occurred in Europe with large-scale afforestation of conifers through artificial regeneration and producing even-aged forests. These ideas were spread throughout the world during the 19th century, largely through the colonial administrations of the European imperial powers. This process changed the features of many cultural forest landscapes created by traditional preindustrial societies, both in developed and developing countries. In the 1970s, forestry passed from a phase favoring almost exclusively economic aims, to one paying greater attention to the ecological roles of forests and the value of biodiversity. Unfortunately, the assessment of biodiversity has often neglected components arising from human influence, while monitoring and conservation have focused on "natural" species. The abandonment of traditional landscapes has reduced the diversity of forest management forms, creating simplified landscapes often with reduced biodiversity of habitats linked to land uses and related forest management practices."	Furthermore, the ECA assessment has established an ILP liaison group (Chaired by Zsolt Molnar) that is responsible for all aspects of ILKP within the assessment, including the SPM. We feel that this has improved the integration of ILKP within the SOD.
Germany	General		0			We believe that the regional ECA assessment generally has a comprehensive and scientifically sound structure: Status as well as trends are shown. It is however a first order draft and therefore, we hope that our comments will be useful for the further development and maturing of this regional assessment so that scientifically sound options for action can be derived. It needs to be critically highlighted in the first order draft that chapter 6 (Options for governance, institutional arrangements and private and public decision making across scales and sectors) refers to international organizations and treaties, thereby failing to discuss specific institutions and treaties, which are of relevance to Europe and Central Asia. As we are dealing with a regional assessment for Europe and Central Asia (ECA) we strongly encourage the authors of this assessment to assess regional organizations and treaties relevant to the ECA region so that useful options for actions can be derived for the potential user groups. Please also ensure that in the further development of this assessment key messages with their level of confidence/certainty are developed as outlined in the document IPBES/4/INF/9. Such key messages will be important to develop scientifically sound options for actions. We request the co-chairs of this assessment to ensure that the general comments listed here are made available to the CLAs and LAs of all 6 chapters. Reason: It is important that there is alignment in the use of terminology and structure of the document. In order to further strengthen the storyline throughout the 6 chapters we also encourage cross-referencing between the chapters so that information redundancies are avoided and the arguments are overall strengthened. We also strongly encourage the development of an appendix that lists all the acronyms and key terms (including their definitions) used in the ECA assessment and communicate these lists with the leaders of the other regional assessments to ensure that jointly, all 4 regional assessments can provide a solid basis for the global assessment (IPBES deliverable 2c) by using the same terms and definitions. We very much look forward to the second order draft of this important assessment.	Thanks you for your comments, which have been helpful for the ECA assessment. These comments have indeed been made available to all CLAs and LAs of each of the ECA assessment chapters. Ch6 deals with all relevant decisions makers including regional organisations and treaties. The standard use of terminology is being checked across chapters. The chapters will be cross-referenced and there will be a standard IPBES glossary and list of acronyms. Confidence language has been included for all key findings. However there are different traditions in using confidence language in the humanities and social sciences and this is why confidence language is not used in the key messages concerning for example options for governance. We will thereby avoid being prescriptive and instead provide a portfolio of governance option for decision-makers.
Germany	General		0			Please ensure that the general comments on the ECA assessment are provided to all CLAs and LAs! Reason: It is crucial that the chapters (a) use the same terminology; (b) don't provide redundant information and (c) don't contradict each other, and (d) provide a consistent chain of arguments and discussions.	This has been done.
Germany	General		0			New knowledge und publications should be used, if available. Some cited publications e.g. about the EU CAP (one from 2003) seem to be outdated	Citations have been fully checked and the latest available (up to April 2017) used in the assessment
Germany	General		0			Data and findings of the SoW-Report (The State of the World's Biodiversity for Food and Agriculture, <a href="http://www.fao.org/nr/cgrfa/biodiversity/sowbfa/en/">http://www.fao.org/nr/cgrfa/biodiversity/sowbfa/en/</a> ) from FAO and report from the project "Preparatory Action on EU genetic resources" from COM (for more info: <a href="http://www.geneticresources.eu/">http://www.geneticresources.eu/</a> ) could provide some valuable information for this chapter. Both reports will be published soon. Please check both reports as soon as they become available.	This source of evidence has been checked
Germany	General		0			Often, statements are linked to "Europe" but actually only refer to "Western Europe" or the European Union. Please ensure to present a well-nuanced picture of the ECA-region and state very carefully which sub-regions are concerned (see definitions in Table 1.2, p. 19).	The use of terms to describe the sub-regions has been checked across the chapters
Zsolt Molnar	General		0			The Balkan is heavily underrepresented in all chapters.	We have attempted to achieve a geographic balance right across the assessment, within the constraints of availability of evidence in some locations.
Zsolt Molnar	General		0			Many-many important publications on ILK are not at all used and cited in the assessment (see the literature lists provided by the ILK Task Force, and the Proceedings volume of the ILK Dialogue workshop)	The ECA assessment ILKP liaison group has taken on responsibility for information chapter authors of relevant ILKP literature.
Ayman Batisha	General	1	1	105	4013	The entire report should be homogeneously arranged, logically build and fully integrated with no inconsistency, disharmony or overlapping within its chapters and sections. The titles of chapters and sections are generally too long to be professional, as a quick example "4.6 Status and recent trends in indirect drivers", the phrase "Status and recent trends in indirect drivers of" could be omitted in titles 4.6.1 to 4.6.5.	Consistency across chapters has been verified. Some chapters and sections have changed their names to be more precise.

Ayman Batisha	General		1	1	105	4013	There should be examples/chapter to clarify how the biogeochemical cycle (carbon, oxygen, nitrogen, phosphorus, sulfur, calcium, rock and water etc.) through both biotic (biosphere) and abiotic (atmosphere, hydrosphere, and lithosphere) compartments of Earth can cause land degradation and restoration. Special attention should be emphasized to the human-caused cycle of atrazine, which may affect certain species. Land degradation and restoration should be assessed in the light of Global Changes; Global Warming; Global Sea Level Rise, and Global Ocean. Land degradation and restoration should be assessed into two categories which operates at different time scales: the biological – physical, (Near-term) and the geological, (Long-term). Land restoration opportunities, planning, economics, implementation constraints, and limits should be defined.	The LDR assessment is dealing with land degradation issues and environmental pollution. ECA will take up this evidence where relevant with respect to biodiversity (in Ch3)
Ayman Batisha	General		1	1	105	4013	Research related to the Science of biodiversity and ecosystem services should be emphasized on. Assessment on biodiversity and ecosystem services generally deal with multiple meanings of fuzzy concepts, so it is strongly recommended to add chapter/section to provide General Guidance to the subject of how applying fuzzy concepts in the context of biodiversity and ecosystem services using soft computing techniques. The scope of soft computing covers the areas of Fuzzy Logic, Neural Networks, Chaos Theory, Evolutionary Computing, Rough Sets, Ant Colony, Immunological Computing, Particle Swarm, Wavelet, Probabilistic Computing, Hybrid Methods and other similar techniques to address real world complexities achieving tractability, robustness and low cost solution. The chapter may be devoted to effective approaches to Data Collection; dealing with Uncertainties; Methodological and efficient technique Choice; Time Series Consistency Identification of Key Categories, and Quality Assurance/Quality Control and Verification. The application areas of soft computing include but are not limited to Detection and Attribution of biodiversity and ecosystem services: from Global to Regional and local, biodiversity and ecosystem services Projections and Predictability (Near-term and Long-term), biodiversity and ecosystem services and its relevance for future Global and Climate Change. Detection and attribution of observed and multi-sector biodiversity and ecosystem services, emergent risks, key vulnerabilities, and opportunities should be addressed. Biodiversity and ecosystem services should be assessed in the light of statistical analysis and levels of confidence.	Literature on these topics has been assessed along with other sources of evidence in terms of how these methods contribute to understanding of biodiversity and ecosystems. Chapter 5 is concerned with the use of models supporting biodiversity and ecosystem knowledge.
Ayman Batisha	General		1	1	105	4013	Atlas of Continental, Regional and local biodiversity and ecosystem services Existing, Projections and Predictability should be annexed.	Sorry we do not understand this comment
Marcus Zisenis	Chapter 4	General		0			Again, it is not clear for me what basically distinguished this chapter from the others also regarding an assessment or widely description of biodiversity trends, drivers, and values related to them. Could all these different chapters be put together in one, because at first glance they all seem to deal with the similar subject? This would also help to reduce the length of the whole report significantly for a higher chance to attract readers. Concrete recommendations for politicians would be also most helpful here to alter negative impacts on biodiversity values.	Followed scoping document
Sigrid Kusch	Chapter 4	general		0			The chapter positively stands out by the fact that it is written to be well readable and highly informative to the reader - the information is well condensed and well presented. Unfortunately some key sections have not yet been completed at this stage. The recently (2016) released UNEP pan-European Geo-6 regional environmental assessment might contain useful information, <a href="http://uneplive.unep.org/theme/index/18#V1k0f2Y7Zpk">http://uneplive.unep.org/theme/index/18#V1k0f2Y7Zpk</a> ( <a href="http://uneplive.unep.org/media/docs/assessments/Geo_6_Assessment_pan_European_region.pdf">http://uneplive.unep.org/media/docs/assessments/Geo_6_Assessment_pan_European_region.pdf</a> )	The GEO-6 Report offers important data, e.g. "The externalization of pan-European land demands means that for every hectare of land used in the region, four are used elsewhere to meet the final demand in the region's economies." (to 4.8 Footprints); "In Western and Central Europe, only 38.4 per cent of the original species abundance remains, while 77 per cent remains in the Russian Federation." (Direct Drivers)
Marie Stenseke	Chapter 4	general		0			The concepts 'nature's benefits to people' and 'good quality of life' should preferably be used instead of 'ecosystem services' and 'human wellbeing, where appropriate	We have changed to "nature's contributions to people" throughout the chapter, except when the assessed literature uses ecosystem services. We have inserted the whole IPBES conceptual framework as a figure under 4.1.3 since this framework is essential for understanding how indirect and direct drivers are constructed in this chapter.
Marie Stenseke	Chapter 4	general		0			There is a tendency in the text to explicitly or implicitly treat 'changes' as always negative. I would like to see it clarified in the beginning that change itself is a neutral concept, and even though most changes in biodiversity and nature's benefits to people are negative, there might also be positive changes, and also that the text in the rest of the chapter is revised accordingly.	We have added a sentence in relation to IPBES conc framework under 4.1.3: "Drivers have not only negative effects on biodiversity and nature's services or contributions."
Guy Pe'er	Chapter 4	general comment		0			there is a need to frame the chapter in the key geopolitical and economic processes taking place in the last 20-30 years, much beyond the fall of the USSR. These include the expansion of the EU (and hence expansion of the CAP, Cohesion policy and the Bird, Habitat and Water Framework Directives), the economic crisis in Southern Europe, and the reforms of the Common Agricultural Policy. Changes in the way economic collaboration takes place (bilateral agreements) have major effect on biodiversity. Land-grabbing is a major issue in Central and Eastern Europe as well.	We find this comment challenging and have tried to address it as much as possible. To some extent we address these issues under costaliation and land abandonment but the literature we found has not pointed out these specific economic crises or bilateral economic agreements like land grabbing. We already discuss EU CAP reforms and the expansion of EU, mainly in post-communist countries.
Guy Pe'er	Chapter 4	general comment		0			trends in agrochemical use, field size, and consequently number of farmers are lacking in the chapter. A review divided into 4 regions of the EU can be seen in Pe'er et al, demonstrating trends in NW EU versus other parts (N, S, E), including Supplementary Material on jobs in agri 2005-2010. Ref: Pe'er G., Dicks L.V., Visconti P. et al. (2014) EU agricultural reform fails on biodiversity. Science 344, 1090-1092.	thank you for the recommendation. We have much expanded this section.
Guy Pe'er	Chapter 4	refs		0			These key references occur in Chapter 3 and are useful also for Chapter 4: Van Swaay C.A.M., Harpke A., Van Strien A. et al. (2010) The impact of climate change on butterfly communities 1990-2009. Report VS2010.025. Butterfly Conservation Europe & De Vlinderstichting, Wageningen. Van Swaay C.A.M., Van Strien A.J., Aghababyan K. et al. (2015) The European Butterfly Indicator for Grassland species 1990-2013. Wageningen. EEA. (2013) The European Grassland Butterfly Indicator: 1990–2011. European Environment Agency, Luxembourg; Publications Office of the European Union. // Devictor V., Julliard R., Couvet D. & Jiguet F. (2008) Birds are tracking climate warming, but not fast enough. Proceedings of the Royal Society Biological Sciences Series B 275, 2743-2748. // Devictor V., van Swaay C., Brereton T. et al. (2012) Differences in the climatic debts of birds and butterflies at a continental scale. Nature Clim Change 2, 121-124. // Gregory, R. D., and A. van Strien. 2010. Wild bird indicators: using composite population trends of birds as measures of environmental health. Ornithological Science 9:3-22.	We thank the referee for these valuable suggestions, some of it has been included in the SOD.
Guy Pe'er	Chapter 4	General		0			Important link between Chapters 4 and 5 is the issue of Scenarios. Relevant projects dealing with scenario-developments: MultiAgri, PRELUDE, ATEAM, RIKS, VOLANTE	We have not included links to scenarios.
Frank Wugt Larsen (EEA input)	Chapter 4	General		0			General: Would frame it more as DPSIR – drivers (human activities and needs) inducing direct (e.g. land use) or indirect pressures (e.g. climate change) affecting ecosystems and biodiversity (see also MAES/EEA ecosystem condition report). The dimension of ecosystem / biodiversity quality as being being important for service capacity could be made more explicit. The current concept blurs the attribution issue on which driver contributes to which pressure affecting ecosystems and biodiversity. @	We find DPSIR to be out-dated and we have added a sentence in relation to DPSIR under 4.1.3: "Unlike the DPSIR framework, we do not limit "drivers" to having negative effects on biodiversity or ecosystem services/nature's contributions to people (see below)."
Allan Watt	Chapter 4	General		0			Over-fishing and over-capacity are referred to here (and elsewhere) but on page 15 it states that "Finally, we refrain from using terms that contain a valuation. We therefore assign the term natural resources exploitation, instead of calling the class over-exploitation..."	We have changed this to: "Finally, we try to avoid refrain from using terms that contain a valuation. We therefore assign the term natural resources extraction, instead of calling the class over-exploitation, as in MA (2005a, 2005b). However, since over-fishing is such an established term used as a description of global fisheries (Worm et al. 2006), we use both fishing and overfishing."
PESC-3	Chapter 4	0		0			add spread of illnesses due to increased human activity as a driver of change/threat	We see spread of illness as an effect of several drivers.
PESC-3	Chapter 4	0		0			provide clarification of speed of adaptation compared to climate velocity and human activity impact of different systematic group and ecosystems	We have discussed this under temporal effects of CC
PESC-3	Chapter 4	0		0			Rotational grazing is not covered, overgrazing has effects on diversity	now covered
PESC-3	Chapter 4	general comment		0			ILK is missing widely and should be more explicit, key references are missing	We have added ILK aspects at some places and have added a section 4.5.5 traditional land use.
PESC-3	Chapter 4	general comment		0			Whole chapter quite European based, including its worldviews and values	This has been substantially improved, especially on land-use change, where the contexts differ the most.
PESC-3	Chapter 4	general comment		0			Suggestion to re-organise the chapter according to 1) different topics/drivers, e.g. climate change, land use change etc., and/or 2) sub-regions (as is already done by the sections on indirect drivers 4.6 and 4.7)	The Chapter has been re-organised accordingly, where appropriate. Indeed, we have integrated the assessment of indirect drivers with the direct drivers.
PESC-3	Chapter 4	general comment		0			Some historical events are maybe overemphasized, e.g. breakdown of the soviet union	The breakdown of Soviet Union cannot be over-emphasised as indirect drivers because it has revolutionised land-use and changed other indirect drivers too. However, text has been improved to avoid repetitions.
PESC-3	Chapter 4	general comment		0			Links between chapter should be made clearer	This is still a challenge. In the scoping document Chapter 4 should assess effects of drivers but not specific effects on species in specific sub-regions because this belongs to Chapter 3. For example, overfishing is assessed in detail in Chapter 3 so we omitted this. Past agricultural policies are assessed in Chapter 6 so we also omitted a detailed assessment of these institutional drivers. After reading the SOD of other chapters we will refer to them to explain our adaptations.
PESC-3	Chapter 4	general comment		0			Concepts of drivers need to be clarified, terminology unclear, e.g. driver versus pressure (driver could be both positive and negative)	We have addressed this under 4.1.3, see above.
PESC-3	Chapter 4	general comment		0			There is a lot information on the global scale which might also be better placed in the global assessment rather than the regional	We have replaced global data with regional data as much as possible. For pollution and natural resource extraction it was difficult to find data for Eastern Europe and Central Asia: we prioritised data from these regions in the assessment of land use change.
PESC-3	Chapter 4	general comment		0			Selection of literature needs to be explained, e.g. why aren't publication before 2006 covered?	We have clarified under 4.1.5 Methods why older literature was not assessed: we believe this was covered by the MA (2005).
PESC-3	Chapter 4	general comment		0			Drivers which are not covered in detail should nevertheless be listed – and explained why there are not in the focus of the chapter	In the SOD we have assessed all five direct drivers and in all sub-regions, where appropriate. The highest variation among sub-regions are in land-use change so our literature search in non-English languages was targeted at land-use change. In comparison, the drivers of natural resource extraction and pollution is more similar across sub-regions.
PESC-3	Chapter 4	general comment		0			Inconsistency regarding the definition of "Europe"	Has been changed.
PESC-3	Chapter 4	general comment		0			More case studies might be included to shed light on certain aspects and case studies should be balanced across sub-regions	A lot more data from EE and CA have been assessed, especially for Land-use change (section 4.5).

PESC-3	Chapter 4	general comment	0			When figures from other assessments or studies are used, they should be adapted to the current needs/focus to be more illustrative and make better reference to the ECA region	Yes, this is our ambition.
PESC-3	Chapter 4	general comment	0			Suggestion to include a timeline with recent major socio-political events in the region which have been impacting on nature conservation/biodiversity à might be best placed in chapter 1 of the assessment	We have not included such a time-line
PESC-3	Chapter 4	general comment	0			Invasive alien species: there is currently much focus on the terrestrial impacts but less on marine and other biomes – should be expanded accordingly	Has been addressed, also under indirect drivers.
Anahi Espindola	Chapter 4	General	0			The chapter is pretty complete and it is obvious that giving an overview of the drivers of change in the area is a pretty monumental work. I have two main general comments: 1) although I understand the logic behind organizing the chapter by driver types, status and then trends, I find it really hard to follow and interpret the information. I have the feeling that having it presented that way makes the information be pretty choppy, and it is hard for a person who is not a specialist of every single of these drivers, to be able to remember what exactly everything refers to when the same driver is treated again in a different section. I strongly suggest that instead of using the structure used here, you follow a structure based on each driver, and within each driver you present first the driver itself, the status and the trends. I feel that such a structure will be clearer, more straightforward and more informative than the current one. Further, I don't think that following such a structure would require a lot of rewriting, since what I'm proposing is just reorganizing the current text differently within the chapter. 2) my second general comment corresponds to the use of the word 'habitat'. Within this chapter the word is used both to represent an area (using it thus in a spatial framework, for example 'natural or semi-natural habitat', when referring to wild or natural lands), but also to present the habitat of a species, that is the resources needed by a species to survive and reproduce (for instance, in the framework of land use, when referring to losses of certain elements that are required by species to survive). I think that these two words should not be used for these two very different concepts, and it would be good to agree on its use, and for instance use 'habitat' for the case of species requirements, and natural landscape or lands or areas, when referring to actually specific regions or zones that harbor certain wild or untouched areas. I think that choosing this wording will clarify the text and will make it more specific.	We have taken this comment very seriously and completely re-organised the whole chapter. There are several ways to organise a text on Drivers. 1. according to the drivers; 2. according to sub-regions. To make it further more complex, the assessment of indirect drivers can be organised 1. according to individual indirect drivers (we do so in section 4.3 where general trends are assessed); 2. according to Direct drivers (we do so in 4.4-4.8 where sub-sections assess all kinds of indirect drivers influencing one direct driver); 3. according to sub-region (we assess impacts of indirect on direct drivers for each sub-region in 4.4-4.8 when this is adequate). Concerning habitat: this is an assessment of existing, diverse literature using several conceptualisations on habitat and other concepts. Even if we agree with the reviewer we find it very difficult to translate all literature to fit a consistent framework.
Germany	Chapter 4	General comment	0			Ensure that the text in this chapter becomes more focused. There are numerous repetitions.	Agree. This is our ambition.
Germany	Chapter 4	General comment	0			Ensure that all facts (numbers, percentages, statements, citations) are provided with at least one reference.	Agree. This is our ambition.
Germany	Chapter 4	General comment	0			Some of the sections discussing issues in the subregions "Western Europe", "Central and Eastern Europe" and "Central Asia" are entirely disproportionate. Surely, there should be some more data, publications, and country examples available which should allow a more balanced discussions on and between these subregions.	Agree. This reflects journal articles in English. One of us (CLA) has done a tremendous job to involve new contributing authors with slavic languages competence so there is much better balance now, especially for land-use change (4.5).
Germany	Chapter 4	General comment	0			Please develop self explaining graphs of high quality in the Second Order Draft and in the SPM.	We have explained the graphs in the SOD but not yet asked for permissions or looked for original graphs.
Germany	Chapter 4	General comment	0			Throughout the chapter a lot of detailed information is given on climate change issues. Please consider condensing this information and reducing the amount of graphs and tables showing time series, which underpin for instance changes in temperature, rainfall shifts etc.... Also many of these figures have an extremely low resolution quality and are therefore hard to read. Another way could be that you insert many of these graphs and tables in an annex.	We have cut down the text and some graphs. We learnt lately that appendices are allowed and will consider using appendices for some graphs. Higher resolution will of course be used in the final submission.
Germany	Chapter 4	General comment	0			Most statements are not associated with quantitative likelihood statements nor qualitative confidence levels as outlined in Chapter 1, section 1.6.1. In some cases additional qualitative confidence statements that are not in line with the definitions in Chapter 1, like "It is very well established that...", are used. We strongly urge to use the agreed language for the level of uncertainty across the report and to provide clarity and transparency about which uncertainty terms are applied in all chapters through 'uncertainty accounts' as explained in chapter 1, p. 34, 1-955-960. A coherent and adequate treatment of uncertainty is essential for the credibility of the assessment and, finally, the integrity of the IPBES. We strongly encourage you to look into the use of confidence terms used by the IPBES as outlined in IPBES/4/INF/9 pages 60-65.	We have improved on this part.
Douglas Nakashima	Chapter 4	general	0			Chapter 4: Similar remark as in chapter 3: As stated in the first general comment, some papers, books, or conference proceedings, report a wide array of observations made by indigenous and local people regarding changes in biodiversity, ecosystems... Notably, for Arctic regions, the works of Tero Mustonen provide rich information, especially the book "Snowscapes, dreamscapes- snow change book on community voices of change" by Mustonen and Helander. The chapter 3 of the Arctic Climate Impact Assessment (ACIA -Chapter 3: Huntington et al. 2005) also provides a compilation of observations by local community members about climate change in the Arctic and its consequences on the environment. The observations reported can complement the ones made by conventional scientific procedures, or fill gaps for some areas, or provide information at a different scale. They can be factual observations, describing qualitative changes in the environment and species composition, or parts of stories and narratives, embedded in the local conception of the world.	We have expanded ILKP issues in the SOD.
Violaine Brochier	Chapter 4	0	0	0	0	Natural disaster are not presented. They are in the Chapter 4 for Americas. It could be relevant to be detailed in the other regional assessment ?	We only assess anthropogenic drivers in this chapter and do not include "Natural disasters" as drivers. We acknowledge the impacts of hurricanes and tsunamis on ecosystems but treat them as natural events rather than drivers; they could be seen as natural drivers but it's outside the scope of this chapter to assess these. We apply an anthropocentric conceptualisation of drivers where human activities are the units of analysis although we admit that natural events and factors co-create biodiversity effects and NCP. (4.1.4). However, we treat extreme events that have a link to climate change, which we consider a direct driver.
Violaine Brochier	Chapter 4	0	0	0	0	Maybe it could be interesting to remind in this chapter that an important part of industrial production is concentrated in Asia. That's why industrial activities can have significant impacts, and more because of the lake of regulation in some countries.	In the SOD we address this under mineral extraction (4.4.4) and also under Footprints (4.10).
Gregory Inarsov	Chapter 4	1	1	84	2478	Authors provided useful assessment of this highly diverse region. There is shortfall in the amount of data/literature from Eastern Europe and Central Asia subregions, but this seems to reflect a real gap in our knowledge rather than a lack of authorial attention to these subregions. Comments to the entire chapter are as following. 1. IPBES subregions are defined in the documents IPBES/3/6/Add.5 and IPBES/3/18, it is worth to include this definition into the chapter and/or to draw a map. Eastern Europe subregion includes a number of states which entirely or partially are in Asia. From other hand, geographically Eastern Europe is a part of Europe and as such this term is used in literature and can also be found in the chapter. Author team may wish to avoid vagueness using this and other geographical terms. 2. It is not always clear if a bit of text or a figure is taken from a paper, or it is written/drawn by chapter authors. Chapter would benefit if references to literature is provided for all quotations, including figure captures. 3. Glossary of terms should be provided either for chapter or for the entire regional assessment.	We have added a map of the ECA region where we have specified the countries within each sub-region and whether they are member of the EU or not. This is particularly important since much of the literature refers to EU or Europe. With this map and by assessing each sub-region whenever appropriate, we have reduced this vagueness.
Mark Sneath	Chapter 4	33	882	33	833	Not entirely clear, there seems to be an internal contradiction in the sentence	Has been clarified
PESC-3	Chapter 4	5	86	6	153	Executive Summary should be organised by sub-region so that policy makers can easily identify which information is relevant for their sub-region	As mentioned above, we do this wherever possible. However, sometimes drivers operate in a more general way.
Germany	Chapter 4	Executive Summary	86			We welcome the explicit information about the degree of uncertainty for each key finding of the "executive summary" (established but inconclusive; very well established, etc...)? However,	Done.
Germany	Chapter 4	5	87	5	90	The sentence "Direct drivers are the consequences of human activities ..." (line 87) is slightly misleading because in line 89 you mention that "... direct drivers are both anthropocentric and natural ...". Please check whether the wording can be improved. Also ensure that the wording of the definitions of "direct" and "indirect" drivers is used consistently throughout the regional ECA assessment and that the wording of these definitions is in line with the definitions provided in the other three regional assessments. As the regional assessments and the thematic assessment of Land degradation and restoration (LDR) should provide a sound basis for the global assessments (IPBES deliverable 2c) it is also necessary to check how indirect and direct drivers are defined in the LDR assessment (see e.g. chapter 3, page 4: lines 134-139 of the LDR assessment).	We assess five direct drivers which are all identified as human activities. These activities interact with nature and natural processes but we do not refer to these as "natural drivers" and we do not assess trends in hurricanes and tsunamis. Hence we take a similar approach as the MA (2005) did. We develop this under 4.1.4
Gunay Erpul	Chapter 4	5	91	5	91	Why is only provisioning services mentioned here? What about the others?	We deleted "provision of" (it was meant as "supply of"). Now we use NCP most often.
Germany	Chapter 4	5	92	5	92	The five major categories of direct drivers analysed in chapter 4 seem to be all human-driven: "land use change", "invasive alien species", "climate change", "pollution", "natural resource exploitation". Are natural direct drivers not relevant for the ECA region? It would be great if you could expand briefly on why the above major categories of direct drivers were taken into account.	Agricultural drivers are part of the land use change category. Human beings co-create effects on biodiversity and NCP together with natural processes, but we do not assess these processes and we do not like calling them "natural drivers". See 4.1.4
Germany	Chapter 4	5	93	5	93	Please clarify for the entire chapter and assessment report, whether you will use "natural resource" (singular) or plural ("natural resources"). Currently it is mixed.	"natural resource management" is MUCH more common than "natural resources management" in Google scholar so we have Change All to the former.
Christian Rixen	Chapter 4	5	93	5	93	natural resource exploitation is not addressed in executive summary anymore; is that intended?	Have changed wording to natural resource extraction and included it in the Ex Summary and SPM.
Anahi Espindola	Chapter 4	5	104	5	104	many elements of climate change' is a bit cryptic. Maybe just exclude that part, or make it be more detailed.	Done
Anahi Espindola	Chapter 4	5	106	5	106	replace 'projected' by 'predicted' or 'expected'. 'projected' gives the impression that there is a (political, scientific, etc) project to have them increase in the future.	Done
Anahi Espindola	Chapter 4	5	108	5	108	replace 'too' with 'to'	Done
Christian Rixen	Chapter 4	5	108	5	108	will continue to change...	yes
Christian Rixen	Chapter 4	5	115	5	115	Farming, forestry and urbanisation are land-use changes; maybe indicate this. Otherwise it looks like the next paragraphs starts with land-use.	Done
Christian Rixen	Chapter 4	5	116	5	118	Is this a universal change across all regions? Other paragraphs spend a sentence on whether the driver changes across regions or differs between regions.	Yes, for recent changes. The Summary has largely been re-written.
Gunay Erpul	Chapter 4	5	117	5	117	in semiarid regions at the vicinity of big cities, not only cropland but also pastureland has been replaced by urban areas	Done
Forest Isbell	Chapter 4	5	120	5	121	This statement is unclear to me. Is it simply stating that all sub-regions include both intensification and disintensification? If so, then this seems obvious and perhaps not worth highlighting in the Executive Summary.	This is more complex. There are different drivers causing intensification and disintensification. They also play out differently across sub-regions, which we have included in the SOD.
Christian Rixen	Chapter 4	6	131	5	131	...more widespread... than what? Please clarify or reword	Done

Gunay Erpul	Chapter 4	6	150	6	151	Also think about Mediterranean Coasts of Southern Europe	This is what we mean by "Western Europe... coastalisation"
PESC-3	Chapter 4	7	157	25	710	List of drivers needs to be complete and also the ones not being discussed in the chapter should be listed and a rationale why they haven't been chosen, e.g. poverty, CAP reform, global trade, infrastructure development	All of these have been addressed, see Tables 4.3 where we specify driver sub-categories. Poverty is addressed indirectly as the main driver for disintensification. Infrastructure is a land-cover change.
Gunay Erpul	Chapter 4	7	160	7	160	Again mentioned is only provisioning services. I think after a IPBES approach for ecosystem classification, this could be better termed.	Done
Elena Bukvareva	Chapter 4	7	163	7	163	There are three kingdoms of multicellular organisms: Animals, Plants and Fungi. Fungi play a key role in ecosystem processes. Thus, fungi should be added to the line 163	Done
Allan Watt	Chapter 4	7	163			And above and below (fresh and sea) water...	Done
Gunay Erpul	Chapter 4	7	165	7	165	"influenced"	Done
Germany	Chapter 4	7	182	7	184	Please consider deleting this passage as it provides information, which has already been provided in the previous section. Ensure avoiding such repetitions in order to make the chapter concise and punchy.	Done
Germany	Chapter 4	7	193	7	194	On page 5 (lines 92-93) five major categories of direct drivers are mentioned, which you plan to analyse. Either insert all five in the brackets or include the term "etc" in the bracket and write out in full the other direct drivers. It would read (see bold inclusions): "... and direct (climate change, land use change, pollution etc.).	Done
Gunay Erpul	Chapter 4	7	194	7	194	Similarly, why always are provisioning services put forth among others?	"provisioning" was meant as "supplying". We have changed this now to NCP
Anahi Espindola	Chapter 4	8	200	8	200	I understand that the term 'projected' is used in a technical way (these are the projections into the future of models), however, 'projected' can be also understood by the non-specialist as a 'project' to do something (see my previous comment on this). I recommend changing the wording to avoid confusions.	We have replaced 'projected' by 'predicted' or 'expected', here and elsewhere.
Gregory Inarov	Chapter 4	8	201	8	210	Authors may wish to consider the same projection horizon for direct and indirect drivers.	The time horizon varies from context and literature.
Gunay Erpul	Chapter 4	8	204	8	204	"these links"	Done
Asimina Skouteri	Chapter 4	8	206	8		The importance of land use as environmental parameter in evaluation of landscape change is reflected in the development of environmental indicators (Lausch et al., 2002). The Organization for Economic Co-operation and Development, in 1998, has suggested 50 environmental indicators that have relation to landscape change. Eight of them have direct relation with land use (land use change, land cover change, irrigated land, forest land, biodiversity, roads, wildlife refuges, fragmentation of refuges) (OECD, 1998). Many European and international projects focus on collection of land use data (Beale et al. 1997), because it is the first step for the quantification of landscape/ecosystem change and many authors has used landscape indicators to evaluate landscape change (Turner, 1990; Nagaike et al., 1998; Palang et al., 1998; Eetvelde et al., 2003).	Thank you for the suggestion. We have chosen similar sub-categories of land-use change (section 4.5)
Marie Stenseke	Chapter 4	8	212	9		The reasoning on drivers as a concept could be qualified by also referring to theory development on drivers related to land use change, see primarily Hersperger, A.M., Genalo, M., Verburg, P.H. & Bürgi, M. (2010). Linking land change with driving forces and actors: four conceptual models. Ecology and Society, 15(4), s. 1-17, and also e.g. in Brandt, J., Primdahl, J. & Reenberg, A. 1999. Rural land-use and landscape dynamics – analysis of 'driving forces' in space and time. In Krönert, R., Baudry, J., Bowler, I.R & Reenberg, A. (eds.), 1999. Land-Use Changes in Europe and their Environmental Impact in Rural Areas in Europe, 81-102. Man and the Biosphere Series 24. UNESCO and Panthenon, Paris – New York.; Bürgi, M., Hersperger, A.M. & Schneeberger, N., 2004. Driving forces of landscape change – current and new directions. Landscape ecology 19, 857-868; Eiter, S. & Potthoff, K., 2007. Improving the factual knowledge of landscapes: Following up the European Landscape Convention with a comparative historical analysis of forces of landscape change in the Sjødalen and Stølsheimen mountain areas, Norway. Norwegian Journal of Geography Vol. 61, 145-156;	We have used some of these refs already in the FOD. Together they give a comprehensive picture of how drivers can be conceptualised.
PESC-3	Chapter 4	8	212	9	248	Concepts of drivers need to be clarified, terminology unclear and confusing, e.g. driver versus pressure (drivers could be both positively and negatively impacting biodiversity), qualitative versus quantitative changes	We have clarified (see our responses above to the 4th and 5th comments) the difference between drivers and pressures and that drivers can be positive for biodiversity. All changes are qualitative and some can be estimated in quantitative terms.
Allan Watt	Chapter 4	8	213	8	217	The alternative terminology – drivers and pressures – should be acknowledged too, pressures being the equivalent to direct drivers. See e.g. Towards an integrated model of socioeconomic biodiversity drivers, pressures and impacts... (Haberl et al. 2009) and Biodiversity conservation research challenges in the 21st century: A review of publishing trends in 2000 and 2011 (Velasco et al. 2015).	See comment above.
Anahi Espindola	Chapter 4	8	218	8	221	The figure refers not only to ecosystem services, but also to biodiversity. This should also be mentioned in the text.	We have reduced this text.
Anahi Espindola	Chapter 4	8	218	8	227	I think that the authors should cite the figures, but refrain from explaining what each figure means. Indeed, that is the role of a figure legend, and not of a text citing the figures. For instance, instead of saying 'Figure xx shows this and this', you should state something on the lines: 'It has been shown x and y (figure xx)'. This makes the reading more integrated with the figures and less descriptive.	We have deleted these figures that we used for our discourse analysis, critiquing different frameworks and conceptualisations of drivers.
Gunay Erpul	Chapter 4	8	219	8	219	Pereira "et al." (2010)	Done
Germany	Chapter 4	8	219	8	219	Please insert et al. It should read: "... Pereira et al. (2010) have ..."	Done
Germany	Chapter 4	8	220	8	221	Why have institutional and governance issues not been explicitly addressed in Figure 4.1? After all on page 5, line 93 "institutional" is mentioned as one major indirect driver category, which you plan to analyse?	We don't know "why" inst and gov issues were not addressed by Pereira et al (2010). We use this figure to discuss different frameworks for how to conceptualise drivers. We have deleted this figure in the SOD
Gunay Erpul	Chapter 4	8	226	8	226	"contribute to"	Sentence has been deleted
Anahi Espindola	Chapter 4	8	227	8	227	More complex than what? Than in Fig. 4.1? Please, clarify.	We have clarified that Fig 4.2 (now IPBES CF) is more complex than Fig 4.1. Unfortunately the deletion of Figure caption to Fig. 4 2 did not work...
Germany	Chapter 4	9	229			Figure 4.1 Provide a concrete explanation, what the different types of arrows mean.	Deleted figure
Gunay Erpul	Chapter 4	9	231	9	232	"land use" does not always mean "land degradation". Therefore, instead, when applicable it is better to mention "land degradation" instead.	Good point! However, in this particular case "land use" is better because not all changes in land use cause land degradation.
Germany	Chapter 4	9	232	9	232	Please insert "natural". It should read: "... natural resources exploitation or pollution".	Done
Germany	Chapter 4	9	233	9	234	Matter of clarification: Presumably, the MA framework of five types of indirect drivers was developed in 2005 and then further developed by Hauck et al. (2015)?	Clarified and moved to 4.2.2
Germany	Chapter 4	9	234	9	235	Why are the indirect drivers "financial sector" and "existing policies for Green economy" mentioned here? Maybe because you plan to discuss them as part of the indirect driver category "economic"?	We have deleted this sentence
Frank Wugt Larsen (EEA input)	Chapter 4	9	239			Find figure 4.2 more confusing than explaining. The classical "cascade model" (fig. 2 of Potschin & Haines-Young, 2011) would be better than	We have deleted this figure, replaced it what we REALLY use, i.e. the IPBES framework which presents a novel understanding of drivers.
Anahi Espindola	Chapter 4	9	239	9	243	The legend has to be rewritten to describe the figure.	deleted
Germany	Chapter 4	9	244	9	248	It is not quite clear, what this para is trying to achieve. After all, the previous sections have been concisely differentiating between direct and indirect drivers in order to develop the storyline for discussing current status and trends of direct and indirect drivers. Why only talk about "drivers" now?	Whole para has been deleted
Asimina Skouteri	Chapter 4	8	252	8		Environmental factors are not considered as driving forces of change (e.g. geophysical data, quality of natural resources)? (Hoshino ,1996; Briassoulis, 2000).	Good point! For land-use change we believe environmental factors are important, e.g. for determining which land becomes intensified and which becomes abandoned. This is why we include Fig. 4.4 by van Vliet.
Marie Stenseke	Chapter 4	10	252	11		The reasoning on systems needs to be clarified, and preferably shortened. In accordance with with a large number of literature in humanities and social science, it must not be described as two systems but as one integrated (see e.g. Latour, B. 1993: We have never been modern; Head, L. 2008 Is the concept of human impacts past its use by date? The Holocene 18: 373-7.	We agree, this has been clarified now. We discussed two separate systems before only as a hypothesis, which we rejected. Now we don't spend time on this because obviously it was confusing.
Allan Watt	Chapter 4	10	253			Source / reference needed.	text has been changed
Marie Stenseke	Chapter 4	10	260	10	262	By applying the reasoning above, you do not have to explain why you call it two systems, while they cannot be distinguished	Agree. We have deleted this argument (see above)
Frank Wugt Larsen (EEA input)	Chapter 4	10	264			Figure 4.3 is only explaining climate change but not reflecting natural and anthropogenic drivers as headline of 4.1.4 states so it's a climate change chapter not an anthropogenic drivers chapter. The current version of chapter 4 is very climate change biased but this may change if gaps are filled	Fig 4.3 has been deleted, replaced by a map.
PESC-3	Chapter 4	10	264	10	267	Figure 4.3: link between climate change and land use change is missing, as a necessary arrow between the two central blocks	Fig 4.3 has been deleted
Allan Watt	Chapter 4	10	268	11	281	To say that the assessment will not distinguish natural and anthropogenic drivers does not seem to be consistent with this and other Chapters, which focus on anthropogenic drivers. In any case, it would seem appropriate to consider anthropogenic drivers in the context of natural drivers. Arguably, this is implicitly done here (in this assessment) and elsewhere.	text has been changed and shortened
Germany	Chapter 4	10	268	11	281	Will the regional assessment of "Africa"; "Americas"; "Asia and Pacific" also refrain from distinguishing between natural and anthropogenic drivers? It needs to be ensured that all regional assessments (IPBES deliverable 2b) have the same understanding on this issue, as all four regional assessments should jointly build a common foundation for the global assessment (IPBES deliverable 2c)	text has been changed and softened
Gunay Erpul	Chapter 4	10	271	10	271	"natural elements"	deleted
Gunay Erpul	Chapter 4	10	272	10	272	"Influential factors"	deleted
Gregory Inarov	Chapter 4	10	273	10	276	Climate change can be either of anthropogenic or natural origin, e.g. variations in solar radiation and variations in the Earth's orbit can cause climate change, and human activity is not a force behind these drivers. The same is true for air pollution, it can be a result of volcano eruption. Authors my wish to re-write the paragraph, lines 268 - 281.	In this chapter, we do not assess natural drivers like solar radiation and volcano eruption. This is a deliberate choice, can be clarified more.
Gunay Erpul	Chapter 4	10	274	10	275	"land use and land cover change"	deleted
Gunay Erpul	Chapter 4	10	276	10	276	Rather? (But also.)	deleted
Anahi Espindola	Chapter 4	10	278	10	278	humans as the most dominant form of life': in terms of what? I would avoid using such sentences... Said that plainly, I could also argue that polar bears are the most dominant, because they can eat a bunch of organisms (humans included) and can live in extreme conditions; or that bacteria are the most dominant, because they are the most numerous and affect all environments on Earth... The 'dominance' (or lack of) of humans is a complex subject, and I recommend avoiding these types of expressions if they are not fully supported with more details. Further, I don't think that having or not this type of sentence will affect the strength of your argumentation. and by the way, I think that this paragraph -except this section- is really good, useful and clear.	We believe the argument is pretty simple, if you read the whole sentence: "Yet, humans as one of the most dominant forms of life on earth are strongly and rapidly altering the global system, and therefore, the driver classification directly refers to the consequences of human activities, irrespective of how much or to what degree human activities interacted with biogeophysical factors." This is the basis for the "Anthropocene"
Marie Stenseke	Chapter 4	11	282	11	282	By applying the reasoning above, you do not have to explain why you call it two systems, while they cannot be distinguished	The title of the Box is rhetorical.

Gregory Insarov	Chapter 4	11	282	11	283	Box 4.1, paragraph 4. References should be added.	Done
Allan Watt	Chapter 4	11	285			BD is a horrible acronym and should be avoided.	Section 4.1.5 has been deleted
Allan Watt	Chapter 4	11	286	12	302	Sources / references needed or refer to another Chapter.	Section 4.1.5 has been deleted
Mark Sneath	Chapter 4	11	291	11	291	"were converged" should read "was converted"?	Section 4.1.5 has been deleted
Marie Stenseke	Chapter 4	11	292			Pristine is a problematic term, not the least in relation to uses of indigenous and local people.	Section 4.1.5 has been deleted
Gunay Erpul	Chapter 4	11	292	11	292	"0.2% of pristine forests has been preserved"	Section 4.1.5 has been deleted
Anahi Espindola	Chapter 4	11	293	11	296	Are there any indications of adaptation of these species to human activities? Since these activities have been happening for millennia in the area, it is possible that several species adapted to these human-related environments could have evolved to survive in those areas. I found some works on the effect of urbanization on adaptation by organisms, and although I could not find any study on agricultural environments, I suspect that there may also be examples on that...	Section 4.1.5 has been deleted
Gunay Erpul	Chapter 4	12	301	12	301	"have resulted in"	Section 4.1.5 has been deleted
Elena Bukvareva	Chapter 4	12	302	12	302	It is necessary to add some words about the Asian part of ECA. 1) Until the first half of the 20th century the Asian part of Russia was little changed by humans. 2) In Soviet times, industrial development has affected some regions of the southern Siberia. 3) In the period of the Virgin Lands Campaign in Soviet Union (1955-1965) tens of millions of hectares of steppe lands were plowed in northern Kazakhstan, southern Siberia and Urals. As a result steppe biome in the Asian part of ECA was radically transformed. 4) In Central Asia, the most productive lands along the rivers were used for agriculture for centuries. Unproductive steppes, semi-desert and desert areas used for traditional forms of livestock and remained slightly transformed. 5) After 1960 the Aral sea level began to decline due to the intensification of water extraction from the rivers Syr Darya and Amu Darya. This process, together with climate changes has led to the drying up of Aral sea and environmental catastrophe for the region.	Section 4.1.5 has been deleted. We do assess LUC in Asia later in the chapter. This will be developed in much more detail for the SOD
Gregory Insarov	Chapter 4	12	303	12	310	References should be added.	Section 4.1.5 has been deleted
Gunay Erpul	Chapter 4	12	309	12	309	"than that covered in"	Section 4.1.5 has been deleted
Allan Watt	Chapter 4	12	317	12	324	General point. This amount of detail is very useful and I hope it will be retained: it allows the reader to assess the strength of the conclusions in the assessment.	Thanks
Anahi Espindola	Chapter 4	12	319	12	320	Why was more weight given to literature dating from after 2005?	due to MA (2005) assessing the same literature. Has been clarified in text.
Gunay Erpul	Chapter 4	12	321	12	321	"were considered"	Done
Gunay Erpul	Chapter 4	12	325	12	331	I think in relation to land use and land cover change, there might also be a wealth of information available on land degradation. I assume embedded experts of LDRA could succour for this contained	Land degradation is now included
PESC-3	Chapter 4	12	332	13	367	too much emphasis on the climate change issue / IPCC and far less on the land use change issue: text is too technical; no reference to JRC	LUC is much enlarged, was not treated appropriately in the FOD text
Anahi Espindola	Chapter 4	12	332	13	364	This section is extremely technical and explains a 'mat and methods'. Can't this be added as an appendix instead? I think that having it here distract the reader and disturbs the logic of the read.	We improved this section
Sigrid Kusch	Chapter 4	13	349	13	351	Chapter 1 contains a list of countries in the region and in the subregions. It should not be necessary to refer to the scoping document. Is the definition of subregions you have used the same as listed in Chapter 1 of the report?	We thought we need to provide the content of the chapter as if it were stand alone... We find it best practice to keep this listing here.
Gunay Erpul	Chapter 4	13	354	13	364	if IPBES has a new biome classification, could this text need changing?	WE now use the new biome classification
Gregory Insarov	Chapter 4	13	359	13	359	Authors may want to explain what is RCP, and to include references for future explanations.	WE now include an explanation of RCPs
Gunay Erpul	Chapter 4	13	359	13	361	Unclear, the long sentence has no verb!!!	We corrected this sentence
Anahi Espindola	Chapter 4	13	365	13	365	The explanation of how to read a box plot is unnecessary.	adjusted, thanks
Marie Stenseke	Chapter 4	14	369		381	Whatabout books and book chapters? There is probably a natural science and quantitative science bias in this selection, compared to studies in e.g. history and anthropology	True. We started with literature search in Scopus (and also Web of Sc) but we have complemented this with other literature that we already knew of or were recommended, including grey literature (e.g. EU Reports). Should we add info on this? Some references we use take historical perspectives (long time horizons).
Gregory Insarov	Chapter 4	14	369	14	388	Using this method of literature location, many relevant publications can be missed, especially publications from Eastern Europe and Central Asia subregions. Authors may wish to consider all available publications in peer-reviewed journals and edited books for all the chapter, and to pay more attention to published reviews and assessments, such IPCC WG2 AR5 Chapter 4. Terrestrial and inland water systems and regional chapters 23 Europe and 24 Asia. For two ECA subregions mentioned above, available grey literature should be also considered.	Good point. This is exactly what we have done and we explain the EE and CA parts. We have also used IPCC refs and refer to this.
Gunay Erpul	Chapter 4	14	369	14	386	Similarly, embedded and liaison experts of LDRA could help this part be improved significantly. When compared to the climate part, this part seems insufficiently covered.	LUC is given most attention in the whole chapter but we have very refs to LDRA.
Allan Watt	Chapter 4	14	369	14	386	As above.	as above
Germany	Chapter 4	14	369	14	376	Please expand on why you did not use peer-reviewed articles published before 2006? Does this have to do with the publication of the MA in 2005? If so, then please provide this information.	see above
Thomas Brooks (IUCN)	Chapter 4	14	382	14	386	Impressive. It would be worthwhile pulling some discussion of language for literature search throughout the entire assessment up to Chapter 1. Presumably there is relevant material in many other ECA languages beyond English and Russian?	Yes, Ukrainian.
Gunay Erpul	Chapter 4	14	389	14	394	On the basis of biome and ecosystem services if there is a strong interactions among sub-regions, how do you deal with this kind of complication?	True, there are strong interactions, e.g. related to the expansion of the EU and its CAP. But also migration patterns between the sub-regions. We try to assess that.
Elena Bukvareva	Chapter 4	14	404	14	404	Add "EE: Eastern Europe"	Done
PESC-3	Chapter 4	15	416	25	710	some issues/drivers are assessed in great details whereas others are kept very brief - there should be a better balance	Yes, for the SOD we have covered all indirect drivers and assessed much literature on EE and CA.
Santosh Kumar Mishra	Chapter 4	15	417	15	418	Under section 4.2.1 Direct drivers (Page 15, Line 417), add the following information before 1st paragraph [starting with sentence: The Millennium Ecosystem Assessment (MA, 2005a, 2005b) distinguishes 5 major classes of direct .....]: The Millennium Ecosystem Assessment (MA) was called for by the United Nations Secretary-General Kofi Annan in 2000. Initiated in 2001, the objective of the MA was to assess the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being. The MA has involved the work of more than 1,360 experts worldwide. Their findings, contained in five technical volumes and six synthesis reports, provide a state-of-the-art scientific appraisal of the condition and trends in the world's ecosystems and the services they provide (such as clean water, food, forest products, flood control, and natural resources) and the options to restore, conserve or enhance the sustainable use of ecosystems.  The MA, like the Intergovernmental Panel on Climate Change (IPCC), assessed current knowledge, scientific literature, and data ( <a href="http://www.millenniumassessment.org/en/About.html#1">http://www.millenniumassessment.org/en/About.html#1</a> , accessed on June 18, 2016). ☹	Why adding this info? Should we also add info on what IPCC is and LDRA and all other background info? We already emphasise the MA in text and Table 4.2.
Elena Bukvareva	Chapter 4	15	418	16	444	The construction of hydraulic structures should be included among direct drivers. It is the powerful factor of transformation of freshwater ecosystems. On the one hand, dam construction transformed all the major rivers of the East European Plain (Volga, Dnieper, Don) and partially Siberian rivers into cascades of reservoirs. River ecosystems were radically transformed. On the other hand, construction of channels has opened the way for species invasions not only from one river to another, but also between different sea basins (between Baltic, Black and Caspian seas if speak about East European Plain). It is also advisable to include corresponding subsections in sections 4.3 and 4.4	There are many forms of drivers that can be added, the list is merely endless. In this report, hydrodams would fall under the category "natural resources extraction".
Allan Watt	Chapter 4	15	429	14	431	Please check the reference cited. My understanding is that the authors were referring to biodiversity as a driver of ecosystem services, not as a driver of biodiversity itself. It's not a crucial point anyway and I would recommend deleting it.	The main goal of this publication was to assess drivers of ecosystem change to model ES. We still find that biodiversity as not a driver of Ecosystem Change.
Thomas Brooks (IUCN)	Chapter 4	15	430	15	433	The authors' approach on both points here is very sensible.	We have revised this now and use "extraction" instead of over-exploitation. And fishing instead of overfishing.
Gunay Erpul	Chapter 4	15	441	15	441	Table 4.1. "land use and land use change" is this used interchangeably with "habitat change"? (land cover and land cover change, SDG Target 15.3). Does it need a common terminology?	This table has changed considerably and no longer follows this terminology
Gunay Erpul	Chapter 4	16	445	16	452	I think at this point a closer coordination is in need with IPBES - LDRA	There were attempts to better coordinate, also with other regional assessments. The result was not fully satisfying.
Elena Bukvareva	Chapter 4	16	445	16	468	It is useful to note in one of these two paragraphs that forest and peat fires are a significant factor of land cover change. The strengthening the role of fires in ecosystem transformations in the future is predicted.	This section is modified and was rather shortened, so this element is not included in the broad overview, but rather deserves treatment in the new chapter 4.5 (on LUC)
Germany	Chapter 4	16	452	16	452	Please check, how the assessment on land degradation and restoration (deliverable 3b) uses the following terms: "land degradation", "land reclamation", and "land restoration", and provide a definition accordingly so that both the regional assessments and the assessment on land degradation and restoration can be a common basis for the global assessment (IPBES deliverable 2c).	these elements were considered in the new chapter 4.5
Anahi Espindola	Chapter 4	16	469	17	495	This part gives already trends related to invasive species, making this section in particular be different from the others in terms of style and content. I suggest moving any 'trend' information into the 'trends' section, and leaving here only information related to what types of invasives are going to be analyzed.	This section was shortened
Gunay Erpul	Chapter 4	16	474	16	474	in the re-draw of Figure 4.5, could it be possible to have some links between ILK (farmer characteristics and socio-cultural drivers)? It appears this is missing in the figure!	This figure was deleted
Anahi Espindola	Chapter 4	16	496	16	497	Please, rewrite the sentence. It is really hard to understand the message. Why do you say that you won't give many details? I don't completely understand.	done
Anahi Espindola	Chapter 4	16	498	16	501	It would be useful to explain a bit more what some of those categories are, when they are more cryptic, such as in the cases of gene or xenochemical pollution.	these are explained in detail in the new section 4.6 on pollution
Thomas Brooks (IUCN)	Chapter 4	17	499	17	499	It would be useful to spell out the main classes of "xenochemicals".	We only give a very broad overview here and treat the categories in detail in the new section 4.6
Gunay Erpul	Chapter 4	17	500	17	500	"categories"	the sentence has changed.

Marie Stenseke	Chapter 4	17	507	18		This reasoning should preferably also be related to the well established structure-agency thinking in social science, see Castree, N., Kitchin, R. & Rogers, A. (2013a). Structuration. I Castree, N., Kitchin, R. & Rogers, A. (Red.), A Dictionary of Human Geography. Oxford University Press, Oxford; Giddens, A. (1984). The Constitution of Society. Outline of the Theory of Structuration. Polity, Cambridge.	We acknowledge that theories on structuration (Giddens 1984) are relevant here and we discuss the role of structures (institutions) and actors very much in this section, to ensure that people are the agents who change institutional drivers and other indirect drivers. In fact, Fig 4.5 emphasise the role of individual actors in LUC (farmer or land manager) and Fig. 4.6 do this in a more general term, to decrease the risk that "drivers" are seen as natural or mechanistic forces.
Marie Stenseke	Chapter 4	17	507	21		There is a bias in 4.2.2 towards land used for production, primarily agriculture. Hence, the reasoning fits less well on effects from tourism, recreation activities, infrastructure constructions. I suggest not to have figure 4.5, because it narrows the scope. New roads, airports and urban settlements are for example not in the hands of single land owners' decisions.	Fig 4.5 is good for its holistic or integrative perspective on LUC, which is the main driver of ecosystem change. Most social science literature on LUC also emphasise the role of the land manager. We have added infrastructure and tourism in the text to make the figure more general. Figure 4.6 makes our argument more general.
Gunay Erpul	Chapter 4	17	507	18	543	Here, is it going to be referred to some "land use and land cover type classification systems"?	We have revised the sub-categories of LUC
Marie Stenseke	Chapter 4	17	509		517	See comment on page 8 line 212	See our response above
Allan Watt	Chapter 4	18	529	18	534	It is very difficult to find literature on triggers and I suggest that the authors reconsider mentioning it here and elsewhere (e.g. page 22). In any case, the division of triggers and drivers is not consistently applied across the assessment.	We have found literature on triggers and we have made some revisions to use it consistently now. Invasive alien species is not a trigger (will ask my colleague to change this...)
Anahi Espindola	Chapter 4	18	534	18	536	As presented, this sentence seems unnecessary, since it is hard to see the link between this and the rest of paragraph.	Has been re-written
Gunay Erpul	Chapter 4	18	541	18	541	Figure 4.5, what does "accessibility" really mean here? Why is it itemized with natural entities of land (climate, soil, topography)	We just mention several variables which may be relevant here. However, we believe that "accessibility" in this context stands for how close the land is to markets, "vicinity to markets". It is not an economic driver but rather geographical, which fits well with the other elements (we believe).
Gunay Erpul	Chapter 4	18	541	18	541	In the re-draw of Figure 4.5, could it be possible to have some links between ILK (farmer characteristics and socio-cultural drivers)? It appears this is missing in the figure!	Very good point. We considered adding something on this in the text. But decided to keep it very short instead. ILKP is elaborated mainly in 4.5. Land-use change
Gunay Erpul	Chapter 4	19	549	19	549	Figure 4.6 is far from the page where it is referred in the paragraph. It is sort of hard to link text with the Figure.	We have moved discussion on Fig 4.6 (now 4.5) to near the figure.
Gunay Erpul	Chapter 4	19	551	19	551	Table 4.2. What is the position of IPBES for Nature?	Good question. We have not included natural variables or vicinity to market as drivers. For LUC we have found intensification to occur on fertile land close to markets while disintensification occur on "marginal" land where marginal is both a geographical and economic (fertility, harvest level, socio-economic status) concept. Hence these locational factors matter but not as drivers. Strictly speaking.
Germany	Chapter 4	19	551			Table 4.2 Regarding the categorisations of indirect drivers of IPBES: Please align the wording of the indirect drivers mentioned with the wording of the five indirect drivers provided on page 5, line 94: Insert the term "religious" on page 5. It should read: "cultural and religious".	OK
Sigrid Kusch	Chapter 4	19	556	20	593	Where would fostering of the bioeconomy be as a driver? Is it along with "Transformation to green economy"?	Yes. Now we changed this to "material intensity of GDP" and also "Environmental fiscal reform" (which is both institutional and econ driver)
Elena Bukvareva	Chapter 4	19	556	19	559	Perhaps it makes sense to add the economic driver "resource-based (commodity) economy" or "preservation of the resource-based (commodity) economy"? This is a relevant and important driver for Russia.	Yes, we changed this to "material intensity of GDP".
Elena Bukvareva	Chapter 4	20	561	20	581	Institutional drivers in some post-Soviet countries differ significantly from European ones. For example, in Russia in recent years, government policy is aimed at reducing the number of independent NGOs and neutralize their activity. State authorities have little interest in participating in international nature conservation processes. Orientation of the economy on natural resources intensifies. State control of nature protection is weak. Negative effects of corruption schemes and illegal exploitation threaten a number of bio-resources and the most valuable natural areas	Yes, indeed. Text on EE and CA is still under development. Will ensure that the role of independent NGOs is mentioned.
Thomas Brooks (IUCN)	Chapter 4	20	561	20	570	Donald et al. (2007) Science is a key citation, specific to this region, to add here.	The EU Bird Directive is a driver but it is assessed in Chapter 3.
Mark Snethlage	Chapter 4	20	565			"Habitat, Birds and Water Directives" should read "Birds and Habitats Directives and the Water Framework Directive"	Has been deleted
Germany	Chapter 4	20	570			Insert the full reference of the Mid Term Review of the EU Biodiversity Strategy: <a href="http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/mid_term_review_summary.pdf">http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/mid_term_review_summary.pdf</a>	Deleted
Gunay Erpul	Chapter 4	20	571	20	581	Might be to mention the relevant SDG(s) could improve the paragraph.	We have moved this to 4.3
Germany	Chapter 4	20	572			Insert the full reference of the EU Biodiversity Strategy 2020: <a href="http://ec.europa.eu/environment/nature/info/pubs/docs/brochures/2020%20Bio%20brochure%20final%20lowres.pdf">http://ec.europa.eu/environment/nature/info/pubs/docs/brochures/2020%20Bio%20brochure%20final%20lowres.pdf</a>	Done
Gunay Erpul	Chapter 4	20	589	20	589	"have experienced"	ok
Gregory Insarow	Chapter 4	21	598	21	600	References should be added.	text has been changed
Gunay Erpul	Chapter 4	22	632	22	632	Taking Figure 4.6 up earlier in the Chapter helps it read better.	We moved the text on this figure a bit later
PESC-3	Chapter 4	22	632	22	637	Figure 4.6: trade and policy should be added in the framework	Trade is a sub-category of Institution (also policy) and also relevant as Econ driver
Anahi Espindola	Chapter 4	22	632	22	632	I suggest putting biodiversity and ecosystem services at the same level, and have them linked with a horizontal arrow biodiversity -> ecosystem services. The way it is shown right now may give the false visual impression that ecosystem services are affected before biodiversity. Other than that, this figure is really good.	Fig 4.6 has been changed to a CLD. Now Fig. 4.5
Allan Watt	Chapter 4	22	633	22	645	I understand why "people" are included but I'm not sure that it is consistently included in the figure where, for example, it could be argued that human agents are needed to deliver services from ecosystems. In any case, this figure should be agreed with the teams working on other relevant Chapters.	Figure has been changed.
Germany	Chapter 4	22	633			Fig. 4.6 It is difficult to figure out, which arrow is connecting which boxes. Please try to find a design that improves the readability of the black arrows.	Done. (Unfortunately figure caption was not changed, our mistake)
Allan Watt	Chapter 4	23	687	23	690	I'm not sure if this is the best place to include it but recent research on tipping points should be included in this assessment.	"tipping points" is only introduced here, assessed under 4.7 Climate change.
Mark Snethlage	Chapter 4	23	691	23	693	Reformulate sentence: "grain" -> "resolution"?; perhaps avoid words such as "huge" or "enormous"	Huge is OK, we believe, but we changed enormous to "long"
Frank Wugt Larsen (EEA input)	Chapter 4	24	696			Bioscore project ( <a href="http://www.bioscore.eu/">http://www.bioscore.eu/</a> ) could help for 4.2.5 interactions among drivers	for SOD to consider
Mark Snethlage	Chapter 4	24	701	24	701	"address" -> "identify", "single out"?	for SOD to consider
Mark Snethlage	Chapter 4	24	704	24	705	Why giving three examples illustrating one driver and none for the others?	Box 4.2 has been deleted
Gunay Erpul	Chapter 4	25	708	25	709	Box 4.2. In connection to land degradation, the effect of land use-climate change (drought) interactions on biodiversity and ecosystem services could be touched, as well, here.	Box 4.2 has been deleted
Frederic Lemaitre	Chapter 4	25	709	25	710	In box 4.2, please consider these examples of interacting drivers: i) Meller et al show that the magnitude of range shift is linked to CC rather than land-use change (using the case of bioenergy production in Europe, see Meller L, Thuiller W, Pironon S, Barbet-Massin B, Hof A, Cabeza M, 2015. Balance between climate change and bioenergy: conservation implications for European birds. Global Change Biology – Bioenergy, 2015 Jul 1; 7(4): 741–751) and ii) Lamarque et al exemplify the interaction between climate change and land-use (i.e. management) change in grassland ecosystems and the services but they provide in Lamarque P., Lavorel S., Mouchet M., Quétier F. (2014) Plant trait-based models identify direct and indirect effects of climate change on bundles of grassland ecosystem services. Proceedings of the National Academy of Sciences of the USA 111:13751–13756	Box 4.2 has been deleted
Mark Snethlage	Chapter 4	25	709	25	709	The first example is very succinct and reads more like a list of statements without any explanation. It is not very convincing and useful in this form. In addition, the sentences are now separated by semicolons and should be better separated by full stops. Requires further development. The statements would require some quantified support (data, table, graph) to make them credible.	Box 4.2 has been deleted
Anahi Espindola	Chapter 4	25	709	25	709	It would be good to expand a bit on why invasives are correlated with wealth and population size. I can think of some explanations, but at the same time I can also think of the fact that invasives can be also correlated with many other variables, which doesn't necessarily mean that there is any real relationship among those variables and number of invasives. Explaining a bit more would make this be clearer and more straightforward.	Box 4.2 has been deleted
Anahi Espindola	Chapter 4	25	709	25	709	In the case of the pike change in ranges, are there any indications that the species that are currently isolated and not-predated by pike, evolve into other niches when they do enter in contact with them? In fact, that is a possibility that is generally not much discussed, although we know that such events do occur (for example, the stickleback repeated and fast evolution to avoid predation in isolated post-glacial lakes). Maybe here, or somewhere else in the text, it would be good to introduce the reader to such concepts.	Box 4.2 has been deleted
Anahi Espindola	Chapter 4	25	709	25	709	In the economic and demographic drivers... Part of the box, one should also at least mention that although climate can restrict the spread of invasives, it has been shown that some invasives can expand their climatic niche (and probably evolve) when invading new areas (see for example, Pettipiece et al., 2012, Science, 335 (6074):1344-1348)	Box 4.2 has been deleted
Frederic Lemaitre	Chapter 4	26	712	39	1021	It seems drivers such as global trade are not considered here, while their role in e.g. spreading IAS is demonstrated (see for example Olson D.H., Aanensen D.M., Ronnenberg K.L., Powell C.L., Walker S.F., Bielby J., Garner T.W.J., Weaver G., The Bd-Mapping group, Fisher M.C. (*equal contributors) (2013) Mapping the global emergence of Batrachochytrium dendrobatidis, the amphibian chytrid fungus. PLoS ONE 8(2):e56802 and also Fisher M.C., Garner T.W.J. (2007) The relationship between the introduction of Batrachochytrium dendrobatidis, the international trade in amphibians and introduced amphibian species. Fungal Biol Rev 21: 2–9. doi: 10.1016/j.fbr.2007.02.002)	Box 4.2 has been deleted
PESC-3	Chapter 4	26	712			need to refer to other forms of natural resource exploitation beyond fisheries; currently only Europe is covered - should be expanded to all sub-regions	Yes, we included many other forms in the SOD. This was only an example as we could not complete all other forms of NRE drivers
Douglas Nakashima	Chapter 4	26	712			4.3. Status and recent trends in direct drivers	-
PESC-3	Chapter 4	26	713	28	783	land use change: 1) also positive effects of drivers should be noted, e.g. positive effects of logging; 2) there is a lot of information about the quantitative aspects (e.g forest cover) but not about the qualitative aspects of forests (e.g. degree of fragmentation, tree and age composition); 3) expansion of EU should be reflected when redviewing land use change	We attempt to do so in the SOD text. Many aspects of traditional land use are examples of positive effects, and they are better treated in the SOD text now.
Douglas Nakashima	Chapter 4	26	713			4.3.1. Land use change	-

Douglas Nakashima	Chapter 4	26	713		Land use change due to the abandonment or reconfiguration of traditional / local practices, the latter due to indirect drivers of change: social, economic, cultural evolutions... Agnoletti 2006: (p20) "It has been estimated that in the last 150 years traditional land uses have decreased at the rate of 1 land use every two years. The number of land uses that include trees have decreased from 63 to 6 in several study areas, while 76% of the area is today is comprised of two forest land uses. Thus woodlands have been affected by a simplification of their structure due to the interruption of traditional management practices." Aumeeruddy-Thomas et al. 2012 (France): (p??) "For centuries, the Cévenols shaped the slopes by building terraces and taming the water system, thus changing soil conditions to coincide with ecological requirements of chestnut trees, which thrive in deep soil. Only a few elders and senior farmers are involved in rebuilding or maintaining terraces." Fernández-Giménez & Estaque 2012 (Spain): (p294) "Transhumance enables herders to make use of a wide range of different vegetation and terrain types available at different times of year in different locations. Many producers abandoned transhumance in the 1970s and 1980s for a variety of social and economic reasons." Iniesta-Arandia et al. 2014 (Spain): p1-2 "Mediterranean traditional land-use systems are a good example of social-ecological systems with a high conservation value and a high cultural diversity (Plieninger et al. 2006), where traditional management practices, such as controlled fire use, water management, or terracing, were part of an intermediate disturbance regime that has proven to enhance biodiversity (Blondel et al. 2010). However, Mediterranean systems are currently undergoing intense changes, and, particularly, semi-arid ecosystems are among the most sensitive areas within Mediterranean systems to the effect of drivers of change (EME 2011). These systems are threatened by the increasing adoption of lifestyles disconnected from local ecosystem dynamics (Folke et al. 2011), which have led to a polarization of land-use: the abandonment of land-management practices in some areas and intense use in others (Rescia et al. 2010). Both processes are reducing habitat heterogeneity, landscape multifunctionality and agrobiodiversity (Bugalho et al. 2011; Garcá'a-Llorente et al. 2012), which are related with a decline of LEK [local ecological knowledge] associated to its management (Perrings et al. 2006). Thus, the effect of land-use changes erodes LEK at the same time that it erodes agrobiodiversity and social-ecological resilience (Pretty et al. 2009; Rescia et al. 2010)." (p9) "On the one hand, the mechanization process to obtain more productive crops as a result of the expansion of agribusiness has entailed the intensification of land-use systems and the abandonment of traditional multifunctional land-uses (EEA 2010; Fischer et al. 2012). On the other hand, most of the current conservation policies seek to preserve only the ecological system and those species embedded within it (Maru'n-Lo'pez et al. 2011). A common result of this conservation vs. development model is the break of historical links between ecosystems and social systems and thus between ecological functioning and the functional characteristics of LEK within their specific cultural context. In this sense, a new conservation paradigm should emerge in relation to rural communities of industrialized Mediterranean countries in which the ultimate goal should be to promote biocultural diversity."	This whole section has been largely re-written and expanded. Also, ILK views are now much better integrated. Some of the mentioned references are cited and used.
Douglas Nakashima	Chapter 4	26	713		Mustonen, Zavalko et al. 2004 (Kola Peninsula, Russia) : (p325) "The river Virma grows shallower every year. Now there is hardly any water left and it can freeze all the way to the bottom. There used to be a lot of fish, but now it is almost all gone. I think it is due to the drying of the bogs and marshes, improvements of the ground. Now the melt is slow. (...) " - Vasily Lukov, 21st April 2002, Reindeer breeder PTO-26., Lovozero	Thank you for this suggestion. We attempt to add more examples on local and indigenous knowledge in the SOD draft by March 2017.
Douglas Nakashima	Chapter 4	26	713		ADD a section on traditional management of fire: Fire was used by local populations in many areas in Europe and Central Asia, for different purposes, often managing pastures for pastoralism. The use of fire has contributed to shaping the landscapes. The abandonment of local practices of fire management leads to changes in the ecosystems structures. Traditional practices of burning are still used in some regions though. New practices of burning developed in the field of ecological restoration sometimes associate traditional practices. - Dumez 2004. Grass and fire in the national parc of the Cévennes - Management practices and modes of categorization of pastoralists and managers. (L'herbe et le feu dans le parc national des Cévennes - Pratiques de gestion et modes de catégorisation des éleveurs et des gestionnaires). (PHD thesis - in French). - Goldammer & Page 2000. Fire history of central Europe: Implications for prescribed burning in landscape management and nature conservation. - Seijo et al. 2015 (Spain). Forgetting fire: traditional fire knowledge in two chestnut forest ecosystems of the Iberian Peninsula and its implications for European fire management policy. Land Use Policy, 47(2015): 130-144. - Fernández-Giménez & Estaque 2012 (Spain)	We will see whether we can fit this. This concerns a very detailed information on one specific practice. We usually did not go that much into detail. Maybe it can be used in an ILK example in the SOD text
Germany	Chapter 4	26	713	28	Chapter 4.3.1: In describing land use change the substantial increase in transport infrastructure in addition to the urbanization effects should be addressed. This affects not only large cities and agglomerations. Also rural areas are affected by an increase in infrastructure.	This chapter was largely rewritten and now addresses these issues as well.
Forest Isbell	Chapter 4	26	714	26	715 I would encourage you to be more precise about what human uses are included in this statement, whether Earth's ice-covered surface is included as terrestrial surface, and what the actual percentage used is for the case you consider.	This chapter was largely rewritten and now addresses human land use practices more specifically.
Forest Isbell	Chapter 4	26	714	26	728 This is a great opening paragraph, which frames the European trends within the context of global trends. Nicely done!	Thank you, I hope it is still equally good in the newly rewritten and much expanded version.
Allan Watt	Chapter 4	26	724	26	742 Repetition at start and end of this part.	Repetitions have been removed because the section has been rewritten and expanded
Allan Watt	Chapter 4	26	726		Efficient practices are mentioned but should there be a mention of whether they are sustainable or not?	The newly written parts of this chapter are now more precise regarding sustainability
PESC-3	Chapter 4	26	729	26	741 Need for a clearer definition of forests and distinction from forestry throughout the whole assessment, and especially in this section as an example, in order to avoid misinterpretation of observed trends due to expansion of forestry. Old-growth forests should be dealt with separately.	We agree, and tried to be more clear - in distinguishing between trends in forest cover (LC) and trends in forestry (LU).
Germany	Chapter 4	26	729	26	741 For the data references we recommend referring to FAO FRA 2015 ( <a href="http://www.fao.org/3/a-i4808e.pdf">http://www.fao.org/3/a-i4808e.pdf</a> )	Thank you!
Gunay Erpul	Chapter 4	26	731	26	731 "overall changes"	Thank you, text completely rewritten
Forest Isbell	Chapter 4	26	731	26	738 I doubt that there has been no major overall change in forest cover in Europe given that most of Europe was formerly forested. Perhaps you mean during recent decades or the last century? Please clarify the time frame for this statement and throughout this section.	Yes, it only concerns the recent decades, as this was the goal of the assessment. This is made clearer in the chapter 4.2 now, it is also part of chapter 1
Germany	Chapter 4	26	731	26	733 It is not clear to which time period the statement of the first part of this sentence is relating. Considering the last several centuries the forest cover of the ECA region has decreased considerably!	Recent trends only cover the last 20-40 years, see chapter 1 and section 4.2 (new)
Gregory Insarov	Chapter 4	26	734	26	735 References should be added.	This section is largely re-written
Elena Bukvareva	Chapter 4	26	736	26	737 Intact forests cover about one third of total wooded area in Russia (Intact forests are defined as natural areas within the forest area of over 50 thousands of ha without permanent settlements, transport communications and not affected by human activities) (WWF, 2015) Reference: WWF. 2015. Intact Forest Landscapes of Russia: the current state and the loss of the last 13 years. Moscow. Poster A1 (in Russian)	Thank you for this reference
Marie Stenseke	Chapter 4	26	740		undisturbed natural forests' is a problematic term, especially in relation to indigenous and local use, e.g. reindeer herding and hunting. Change to something like: 'forests little affected by human impact'	we tried to improve in the use of "undisturbed" as we meant without human disturbance. The section is completely rewritten now.
Elena Bukvareva	Chapter 4	26	742	27	762 I propose to add a few words about the Virgin Lands Campaign in Soviet Union (1955 - 1965) in the paragraphs about cropland areas change: "The latest in ECA mass conversion of natural areas into croplands occurred during the Virgin Lands Campaign in Soviet Union (1955 - 1965) . Tens of millions of hectares of steppe in the south of Siberia and Ural and the north of Kazakhstan, previously little disturbed and used for traditional herding were plowed. For several years these areas gave a large grain harvest, but then erosion and dust storms have significantly reduced productivity of these lands".	We have rewritten this section a lot, but we will consider this suggestion for the SOD version by March, as it is a good example of partly unsustainable land use
Forest Isbell	Chapter 4	26	742	26	742 Please clarify the time period over which these changes were quantified here and throughout this chapter.	This is now better included in the new version of the text, thank you.
Mark Sneath	Chapter 4	26	746		Natura2000 -> Natura 2000	changed!
Mark Sneath	Chapter 4	27	757	27	759 Review sentence: verb missing? Like "is expected" or so?	Section is re-written completely
Germany	Chapter 4	27	759	27	762 Is there really solid proof that much of the abandoned agricultural land was converted into urban living spaces in post-socialist countries in Central and Eastern Europe?	We have re-written this section, but we also provided a reference for this statement. It is now made clearer, that some land converted to forests, while other land was becoming urbanized.
Anahi Espindola	Chapter 4	27	770	27	770 What are the shades of green and red in these figures? Are these figures complementary? That is, that the one in the left shows abandonment with no return, and the one in the left shows abandonment with return? As stated in the legend, I was expecting them to overlap, but they don't seem to do so. Please expand the legend to make all this clear.	The figure is no longer used.
Forest Isbell	Chapter 4	27	779	27	780 It is unclear to me how urbanization would lead to farm diversification. Although I trust you are correct, please add a brief explanation clarifying how this might occur.	This section has been moved to indirect drivers and was much enlarged, with more details added.
Elena Bukvareva	Chapter 4	27	781	27	781 Add Eastern Europe in this line	Section is shifted and rewritten, with more details on each sub-region
Allan Watt	Chapter 4	28	783		No information on trends presented here: include if available.	The new text has more details on recent and projected trends, specifically with more focus on recent trends
Douglas Nakashima	Chapter 4	28	784		4.3.2. Climate change	
Germany	Chapter 4	28	784	34	902 Some of the information provided in Section 4.3.2 is taken from the IPCC, but others are not. It is unclear why this distinction (cherry picking?) has been made. For example, Chapter 13 of the AR5 WGII report provides information on temperature and precipitation change. Please make those choices more transparent.	Most information is NOT taken directly from IPCC, but was - as explained in section 4.1.6 (new 4.1.5) - recalculated from the ensemble of GCM models and newly derived. We have calculated trends per ECA subregion and biomes within. This information is NOT available in AR5. We use IPCC where suitable to illustrate trends that are not available for ECA subregions, and otherwise we use more detailed information.
Germany	Chapter 4	28	784	34	902 Please provide references for the numbers given in the text. It is not sufficient to only mention them with the figure.	These numbers are re-generated from GCM output, and cannot be referenced, as they were generated for this report from original data (Ensemble of GCMs used in AR5). Wherever we use data from published material, we provide reference. See section 4.1.5 (new, was 4.1.6) for details on the methods.
Douglas Nakashima	Chapter 4	28	785		Temperature change Hiltunen et al. 2004 (Sweden): (p266) observation from a Sami reindeer herder: "(...) I think that when I started out as a reindeer herder there were more frequent and longer cold spells than what we have now. And with cold spells I mean temperatures lower than -30°C - temperatures between -30°C and -40°C. That was more common thirty years ago. The decrease in the amount of reindeer since 1990's is largely due to these strange winters. With this formation of ice, the reindeer have difficulties to find food". (Rune Stokke, chairman of the Udtja Sameby). Mustonen 2005. Observations by Tamara Andreeva, from the Evenki people in Southern Yakutia: (p20) "Snow is wet and we have much more of it. The snow covered with ice is hard on reindeer hooves and leads to diseases. New diseases in reindeer herds have led to diminished quality of hides. Sable skins are less valuable because they are becoming lighter in color."; "Water is becoming white and fish are disappearing because of coal and gold mining.";	Thank you for this suggestion!

Anahi Espindola	Chapter 4	28	786	28	803	these paragraphs are missing references.	this is because WE recalculated this from GCMs of the AR5 ensemble. It is not published material. No report has published such numbers exactly for the ECA subregions. See section 4.1.5 (new, was 4.1.6) for an explanation on how we derived these numbers.
Frederic Lemaitre	Chapter 4	28	801	34	803	Please consider mentioning the climatic debt of temperature range shifts induced by climate change, as observed for birds and butterflies in Europe by Devicor et al. (2012). Differences in the climatic debt of birds and butterflies at a continental scale. Nature Climate Change 2: 121-124	This is a good suggestion for the climate change IMPACT ON BIODIVERSITY section (new 4.4, but doesn't fit here).
Santosh Kumar Mishra	Chapter 4	30	818			Resolution of Figure 4.10 (Historical temperature trends (1950-2016) for Europe and Central Asia biomes) appearing on page 30 is of poor quality. It is not clearly visible.	we have improved this figure
Germany	Chapter 4	30	818			Fig. 4.10 Please provide a higher quality resolution of Figures 4.10, 4.11, 4.13, 4.17, 4.18, 4.19, 4.21, 4.27, 4.29	we have improved these figures
Gunay Erpul	Chapter 4	30	834	30	834	any comments particularly on snow increase and decrease in the regions comparatively with rain changes would help	the snow-rain shift is not yet included, but it's planned to be included in the next revision
Mark Snethlage	Chapter 4	30	841	30	841	"temperature" -> "precipitation"	thanks, done!
Allan Watt	Chapter 4	32	864			See earlier points about fast drivers and triggers. "Extreme events" seems to be preferable language.	unclear to us, what is meant by this comment
PESC-3	Chapter 4	32	865	33	883	improve the link between fire and drought	done
Gregory Insarov	Chapter 4	33	872	33	873	Reference and more explanation are needed.	done
Allan Watt	Chapter 4	33	874	33	874	I find this hard to believe: data are available in the UK ( <a href="http://nrfa.ceh.ac.uk/">http://nrfa.ceh.ac.uk/</a> ) and surely must be available elsewhere.	we cited a reference for this statement
Gunay Erpul	Chapter 4	33	889	33	889	"are highest" ?	done!
Mark Snethlage	Chapter 4	33	890	33	890	"CO2" is a somewhat cryptic heading for this paragraph. It is clear that the paragraph does not explore the relation between CO2 and climate change (e.g. global warming, changing precipitation etc). The paragraph explains one additional impact linked to CO2 increase (ocean acidification), but why focus on only this, while increasing CO2 concentrations has other direct effects on the ecosystem, e.g. on plant metabolism and growth. References: Taub, D. (2010) Effects of Rising Atmospheric Concentrations of Carbon Dioxide on Plants. Nature Education Knowledge 3(10):21	the effect of CO2 on biodiversity and ecosystems is treated later (section 4.4, was 4.5 in FOD), where effect of direct drivers on BD and ES are treated...
Anahi Espindola	Chapter 4	33	894	33	894	can you give the CO2 ppm content in the initial time periods, so that the reader has something to compare current vs historical concentrations?	a different comment wanted CO2 concentrations farther into the future, which we have done now
Anahi Espindola	Chapter 4	34	898	34	898	are the values pre-1990s available? If they are not, maybe the figure should be cut to not have the initial years be empty.	Not in this AR5 where the graph comes from, we add info from elsewhere
Marie Stenseke	Chapter 4	34	903	36	936	Plants introduced by gardening should also be mentioned. For those kinds of species, the expression "invasion" (line 904, 926, 933) is less appropriate. Alternative terms could be spread, diffusion	invasion is a general term that includes spread or diffusion. Most species are brought intentionally or unintentionally to a new region and start spreading from points of release.
Frederic Lemaitre	Chapter 4	34	903	34	912	Please consider reporting the steep increase in fungal diseases to animals and plants, as reported in Fisher MC, Henk DA, Briggs C, Brownstein JS, Madoff L, McCraw SL, Gurr S. (2012) Emerging fungal threats to animal, plant and ecosystem health. Nature 484: 186-194 (see figure 1 in particular)	the whole section was expanded
PESC-3	Chapter 4	35	913	35	920	Figure 4.16 analyses impacts of invasives per taxonomic groups but this is not reflected in the text; moreover, the figure should be updated (there is actual data after 2000)	the whole section was expanded
Mark Snethlage	Chapter 4	35	923	35	925	Sentence incomplete (no verb)	done, thank you
Mark Snethlage	Chapter 4	35	927	35	929	Sentence is juxtaposition of 2 sentences needs revision	sentence revised
Mark Snethlage	Chapter 4	37	958	38	993	This section seems to be needing some further development	much expanded now
Douglas Nakashima	Chapter 4	37	958			4.3.4. Pollution	
Douglas Nakashima	Chapter 4	37	958			Helander 2004 (Finland): (p308) "Many Sami claim that airborne pollution has increased. The snow can be black, so that every winter there are black snowspots in the mountains. It is like powder or something on the snow and in the snow." Lavrillier 2013 (Russia, Siberia): (p263-264) "Among other factors of the overall change in their immediate environment, the Tungus note the pollution from local mining companies, nuclear power stations, construction of dams, roads, railways and pipelines, coal power plants and other exploitation of natural resources. All have an adverse effect on the immediate natural environment of the hunters, herders and fishermen." Mustonen 2005. Observations by Tamara Andreeva, from the Evenki people in Southern Yakutia: (p20) "Water is becoming white and fish are disappearing because of coal and gold mining;"	thank you for suggestions. We have much expanded on ILK aspects in the SOD text
Douglas Nakashima	Chapter 4	37	958			Mustonen 2013 (Finland). (p85) "Until 2008 or 2009 and when pikeperch started to flourish in the lake due to restocking, we used to fish with winter nets in the deep parts of the lake...Across the deep part. Then we started to wonder as the nets were three meters tall and in the lower part, perhaps for a half a meter or a meter, a brown rust colour emerged. We could not wash it off with anything. Usually we checked nets once a week and if there was a pikeperch on the lower part of the net and it had gone into the bottom mud its gills and mouth were filled with this rust goo." [Snowchange Alavi Oral History Archive 130912] (male fisherman in his 60s) (p85-86) "I believe some kind of a matter has flowed from the forests, and I have to confess that I have played a part in it too myself...as the waters have flowed through my fields and we have used fertilizers to make them fertile. These fertilizers are accumulating and start to grow haw on the lakeshores, and then waves bring these substances to the shores...it was not there when I was a child...it used to be clear sandy beaches, now there is soft and muddy materials in meters at the bottom, in my shore over four meters deep, they say those researchers who have made drilling samples there." (Snowchange Alavi Oral History Archive 171012) (80 year old fisherman and former farmer) (p86) "In the deep spots and on the edge of the deep people have tried to fish and have noticed that there seems to be a lack of oxygen in the winter, not even pike perch persists there. In the summertime the nets become so slimy that I do not really have an interest to fish there anymore." (Snowchange Alavi Oral History Archive 220612) (58 year old fisherman on lake Jukajärvi)	thank you for suggestions. We have much expanded on ILK aspects in the SOD text
Douglas Nakashima	Chapter 4	37	958			Salin et al. 2004 (Finland): (p292) "Juoni Tapiola, a salmon fisherman in Kaava, has lived all his life on the banks of Teno [river]] following the rhythms and flows of the river. (...) The biggest pollutant is agriculture; cow sheds. Especially on the norwegian side where agriculture is well subsidized. But there has been efforts to clean them [the cowsheds in Norway] to decrease emissions. It is said that the Teno water is no longer drinkable, and it can be so. I don't want to drink the water anymore. It has become somewhat eutrophic. The riverbanks used to be very barren; only rocks, as long as I remember there were no bushes growing there. Willow is an indicator if it starts growing, some is now growing and it indicates some amount of pollution (...)".	thank you for suggestions. We have much expanded on ILK aspects in the SOD text
Mark Snethlage	Chapter 4	37	960	37	965	This paragraph is not about nutrients but about polluting chemical substances. Should appear elsewhere in the section. Indeed it is repeated under "Xenochemicals", lines 974 - 978, so should perhaps be eliminated here.	section is largely rewritten and material has been shifted
Germany	Chapter 4	37	960	37	965	Doubling to lines 974-978 same page! Lines 960-965 should be deleted.	section is largely rewritten and material has been cleaned, doubling removed
Violaine Brochier	Chapter 4	37	960	38	994	Nature of pollutants, they are generally classified like that : nutrient, metallic contaminants, organic contaminants, emerging contaminants and plastic contaminants. Plastic pollution (microplastic) is considered as the new major pollution of the XXI century in aquatic environment but also in terrestrial environment. Fate of plastic fragments in environment, trophic network is worrying	We have included all of these substances, even microplastics although not extensively.
Violaine Brochier	Chapter 4	37	960	38	994	Noise pollution could be added as a major disturbance for wild life (there is an abundant literature on this topic). Noise pollution is explained p.60, L1607-1613	Is added now in SOD under "other pollutions"!!
Gunay Erpul	Chapter 4	37	966	37	972	Agriculture related Phosphorus might be also main pollution agent together with Nitrogen	Now separated and expanded
Allan Watt	Chapter 4	37	966	37	972	The European Nitrogen Assessment should be consulted: <a href="http://www.nine-esf.org/ENA-Book">http://www.nine-esf.org/ENA-Book</a> Also, evidence on phosphorus pollution in lakes should be assessed e.g. Phosphorus Legacy: Overcoming the Effects of Past Management Practices to Mitigate Future Water Quality Impairment (Sharpley et al. 2014). There are many studies on this issue but this one and other recent ones by Spears and others deal with the important issue of legacy.	thank you
Gregory Insarov	Chapter 4	37	974	37	978	This bit of text duplicates lines 960-964.	deleted, and text much expanded
Thomas Brooks (IUCN)	Chapter 4	37	979	37	983	EASAC (2015) "Ecosystem services, agriculture and neonicotinoids" is a key citation, specific to this region, to add here.	thank you for this reference
Allan Watt	Chapter 4	37	983			Presumably this section will be expanded to include more pollutants.	yes, done, much expanded
Gregory Insarov	Chapter 4	38	985	38	985	Years when insecticides were used and references should be added.	Years still missing, will be corrected later
Frank Wugt Larsen (EEA input)	Chapter 4	38	985			Figure 4.18 has no source (this is an example. General problem)	Years & reference still missing, will be corrected later
Gunay Erpul	Chapter 4	38	994	39	1021	What other biotic resources (plants, vegetation etc.) are really planned to cover under subtitle? At least could they be mentioned?	This section is much expanded now. Here, we mostly cover Fishing and hunting. The "exploitation of vegetation" is usually treated under land use (resp. agriculture and forestry).
Elena Bukvareva	Chapter 4	38	994	39	994	Forestry should be definitely included in this section (as in Section 4.4.5). In Russia, forestry has been and remains the powerful factor affecting biodiversity and functioning of forest ecosystems. In the European Russia and in the south of Siberia the great masses of primary coniferous forests were converted into secondary small-leaved forests as a result of logging (blue color in Fig. 3.10 in Chapter 3). Their structure and functioning are fundamentally different from the native climax forests. After the collapse of the Soviet Union the volume of logging has significantly decreased, but now it gradually grows. The main problem today is significant share of uncontrolled illegal logging and the unsustainable predatory practices of illegal logging. According to various estimates, the volume of illegal logging in different regions of Russia is up to 25 -56% of the legal production (Bukvareva, Zamolodchikov, 2016). This problem is most critical in Siberia and Far East selling wood to China. Significant part of the profit ends up in corruption chains and does not go to the local budgets. In the coming years we can predict increase in the problem in the context of the economic crisis in Russia. Reference: Bukvareva E.N., Zamolodchikov D.G. (Eds). 2016. Ecosystem Services of Russia: Prototype of the National Report. Volume 1. Terrestrial Ecosystems Services - Moscow, BCC Press (in press).	Forestry and Agriculture are traditionally covered under "Land Use", while hunting and fishing are usually covered under "Natural Resources exploitation". We stick to this classification. However, we have expanded the treatment on forestry and agriculture a lot under LUC, and we now explicitly clarify this distinction at the beginning of the Nat. Res. Expl. section (new: 4.3.5)

Douglas Nakashima	Chapter 4	38	994		4.3.5. Natural resource exploitation Salin et al. 2004 (Finland) : (p277-278) "Veli-Matti Mutenija sees the crash in bird stocks as a sum of various factors. "First of all it is affected by hunting itself and the efficiency of the hunting. For example, capercaille and wood grouse have been protected even for some time to get the stock on the rise again. Then there is all forest cutting adding up. Affecting are also all issues related to small predators; all hawks are now under protective measures and foxes are allowed to hunt only with a legstring (footsnare jalkanaru); iron traps are forbidden. Guns used for hunting have improved and dogs have developed, they are better these days. And there are so much more people hunting now". According to Veli-Matti one more thing has not been studied enough in relation to diminishing numbers of ground birds. "There are hundreds of kilometers of wire-netting fence spread out in the nature, also here in our area. How much are ground birds dying because of that? a bird can not see it too well; the loops are so big in the fence. It is known that even moose get caught in those fences. And reindeer have been stuck on them". (p298) "there have been changes to the Teno salmon over the years and there are threats in the air that could affect its presence. Jouni Tapiola spoke of these issues. "There has been improvement on the salmon stock. It was in the 1970's that the Norwegians prohibited this trawl-like sea fishing. Already in the next year we had small salmon swimming upstream. Nowadays the sea is being fished out of shrimp that is leaving the salmon with only little shrimp to feed on. This has caused the colour of salmon to fade. It is not as red as Atlantic salmon from the Arctic sea used to be. And the flesh or meat, that used to be much thicker in the past. Back then a salted salmon filet was like a wood board. This is also due to overcatching shrimp. The farm salmon is a threat to the wild species in many ways. It has pulled down the salmon price. Now the price for real salmon from Teno is half of what it used to be. Cod is now more expensive than salmon and after the war a kilo of cod was cheap. I don't know what they feed to the farmed salmon but somehow they've managed to colour it red. It is very oily or greasy fish". Jouni Tapiola ranked the salmon parasite, Gyrodactylus salaris, as the number one threat to the River Teno and its salmon stock. He hopes that the parasite could be prevented from entering the river and polluting the salmon. "It [the wild salmon] means so much [to the Sami], in income ways. If there wasn't salmon swimming up this river, I don't think there would be any settlement either".	thank you for suggestions, we could not decide on how to include some of this text. So the comment remains for consideration.	
Germany	Chapter 4	38	994	39	1021	Regarding the discussions in section 4.3.5 on natural resources exploitation, please also cross-check your discussions on marine issues against the findings of the "First Global Integrated Marine Assessment (First World Ocean Assessment)": <a href="http://www.un.org/Depts/los/global_reporting/WOA_RegProcess.htm">http://www.un.org/Depts/los/global_reporting/WOA_RegProcess.htm</a>	thank you for suggestions!
Germany	Chapter 4	38	994	39		Chapter 4.3.5: The exploitation of so-called abiotic resources (f.i. gravel, sand, mineral resources, fossil fuels) impacts on biodiversity. This issue could deserve more attention.	This section is largely re-written and expanded. It now includes most of the mentioned topics. The impact on BD is treated in a later section, though, but is also expanded and rewritten
Elena Bukvareva	Chapter 4	38	996	39	1021	The proposed addition: In 1970-80 in the Soviet Union catch of marine fish was intensified to provide the population with food. As a result, the main commercial fish populations in the seas washing the European part of the country, have been undermined by (Barents, Baltic, Black, Azov, Caspian seas) (Matishov Denisov, 1999). After the collapse of the Soviet Union, the annual catch of marine biological resources has decreased by 2 times. Now the catch in the exclusive economic zone, territorial and internal waters is around 3.5 millions tonnes. More than 90% of total catch is produced in the Far East fishing area (The resource base..., 2012). The legal catch does not exceed the permissible value, but it must be added to the IUUF (illegal, unreported and unregulated fishing). References: Matishov GG, Denisov VV 1999. Ecosystems and biological resources of the European seas of Russia at the turn of XX and XXI centuries. Murmansk: OOO "MIP-999", 124 p. (Матихов Г.Г., Денисов В.В. 1999. Экосистемы и биоресурсы европейских морей России на рубеже XX и XXI веков. Мурманск: ООО«МИП-999», 124с.); The resource base of the Russian fishery in 2012. Information and analytical materials. Moscow: VNIRO, 2012. - 511 p.(Сырьевая база российского рыболовства в 2012 году. Справочно-аналитические материалы. М.: Изд-во ВНИРО, 2012. – 511 с.)	thank you for suggestions. We have much expanded on ILK aspects in the SOD
Allan Watt	Chapter 4	38	1010	38	1010	I would have thought that this is a fisheries crisis too: please clarify.	we revise this section to reflect the comment
Gregory Inzarov	Chapter 4	39	1026	39	1029	References to literature, datasets, web pages and other materials should be added.	there are no references for these tables, rather it originates from a delphi process among all CLAs and LA's to synthesize all material presented on direct drivers into a summary. This is standard practice in such assessments. See e.g. the Millennium Assessment
Frank Wugt Larsen (EEA input)	Chapter 4	39	1026			Table 4.4 the assessment is very different from what EEA/ETC has published so far (e.g. table 5.9 in EEA 2016. Mapping and assessing the condition of Europe's ecosystems. Progress and challenges). It's not clear how table 4.4 has been created. At least the trends don't seem to fit with what ETC/BD had produced for WE. Would propose that authors discuss with ETC/BD on this. E.g. pollution has not been assessed for forests although research should be available (e.g. forest damage research) (see also ecosystem condition report and data sources cited there)	This is still an ongoing process. The tables originate from a Delphi process that will be finished this coming summer 2017
Gunay Erpul	Chapter 4	39	1026	39	1026	Table 4.4.c could require being modified after IPBES classification of biomes is introduced.	the table is now modified according to new biome (units of analysis) classification of IPBES
PESC-3	Chapter 4	39	1026	40	1032	Table 4.4: 1) trends of land use change in Central and Western Europe are the same (first two columns) - we doubt that; 2) symbols of the legend and ist colours should be reworked to improve clarity; 3) content of the table is not too well covered in/aligned with the text	as explained in the text, the table was an example on how it will look like, only based in very incomplete material (clearly stated in the text). It is by no means final...
Germany	Chapter 4	39	1026			Table 4.4 is well done and central.	thank you
Gunay Erpul	Chapter 4	40	1036	40	1036	I think "land use change" is main cross cutting chapter to be used by RA and LDRA and there is a need for significant collaboration.	we have had a cross-sectional meeting in Bonn in August 2016
Germany	Chapter 4	40	1036	40		Chapter 4.4.1: The trend statements on the effects referred to in Chapter 4.3.1 should be supplemented by trend statements on the development of renewable energies.	There is now a section 4.4.1.2.5 on renewable and bioenergy production in the much expanded section
PESC-3	Chapter 4	40	1039	46	1134	too many technical aspects regarding temperature change and precipitation; figures are too technical and mostly on the global scale - should be adapted for the ECA region	These panels and figures shall be improved. However, they exactly represent the ECA subregions, and by no means global aspects! See section 4.1.5 (was 4.1.6) on the methods for explanation.
Germany	Chapter 4	40	1040	47	1171	Meteorological quantities are not "predicted" but "projected" because these numbers are based on scenarios. Please change throughout the text.	thanks, adjusted
Germany	Chapter 4	40	1040	47	1171	Please provide references for the numbers given in the text. It is not enough to refer to the RCP scenarios because the analysis and ranges chosen also influence the results.	see above: these numbers were generated from raw GCM output and not taken from the literature. They refer exactly to the ECA subregions. See method part 4.1.6 (FOD), now 4.1.5 (SOD).
Germany	Chapter 4	40	1040	47	1178	General remark on chapter 4.4.2 Climate Change: when outcomes of scenarios are described it may be better to use the term "projected" instead of "predicted"	done
Germany	Chapter 4	40	1045	40	1046	It seems there is a mistake in the given projection period "Quote: Increases in temperature are predicted throughout the 2016-1960 period for RCPs...". According to Fig. 4.19. shouldn't it read 2041-2060? Please cross-check.	correct
Germany	Chapter 4	40	1046	40	1046	The plateau in temperature mentioned is due to the emission pathway of RCP2.6 which peaks and declines. Information on the scenarios information must be provided.	correct, now added info in 4.1.5 (SOD), was 4.1.6 (FOD)
Germany	Chapter 4	40	1064	40	1065	It seems there is a mistake in the given projection period and the reference level "Quote: ...Central Asia biomes will experience a warming between 1 and 3 C between 1986 -2005 and 2041 -2060...". According to Fig. 4.19. shouldn't it read... 2041-2060 compared to the reference level 1986 -2005 / or: ...2041-2060 relative to 1986-2005...? Please cross-check.	this what we wanted to say... Reworded
Germany	Chapter 4	41	1066			Reference for this figure? Are these global projections from CMIP5?	See methods section: 4.1.6 (FOD) now (SOD) 4.1.5. recalculated from AR5 GCMs
Germany	Chapter 4	43	1081	43	1084	It seems there is a mistake in the projection period given in the legend/caption of Fig.4.21: Quote:" Projected temperature change (1950-2016) relative to 1986-2005 averaged...". According to the axis title shouldn't it read: ...projected temperature change (2041-2060) relative to 1986-2005 averaged...? Please check coherence between figures 4.19, 4.20, 4.21, , 4.24 and the descriptions in the text.	correct, have changed. Thanks for spotting this!
Germany	Chapter 4	46	1131	46	1134	It seems there is a mistake in the projection period given in the legend/caption of Fig.4.24: Quote:" Projected precipitation change (1950-2016) relative to 1986-2005 averaged...". According to the axis title shouldn't it read: ...projected precipitation change (2041-2060) relative to 1986-2005 averaged...? Please cross-check.	as above, corrected
PESC-3	Chapter 4	46	1136	46	1144	the section on sea level rise is very brief and only focusses on the global level - needs strengthening and adaption regarding scale	we expanded this section, with more information on the ECA region
Mark Snethlage	Chapter 4	46	1137	46	1138	"due to various reasons (temperature induced swelling,... only one reason is given and brackets are not closed. Add for example "and melting land ice")	done, thanks
Germany	Chapter 4	46	1143			Fig. 4.25 Please explain, what RCPs stand for.	We now add an explanation of "representative concentration pathways" in the methods section.
PESC-3	Chapter 4	46	1145	47	1178	"frost" should be added as an extreme event	We added a short section on temperature extremes
Gunay Erpul	Chapter 4	46	1146	46	1154	Would main categories (meteorological, agricultural, hydrological, and socioeconomic) of drought be contained in this chapter?	only meteorological, as we refer here to trends of the driver. The impact is treated in later chapters (see TOC)
Mark Snethlage	Chapter 4	46	1168	46	1168	"alpine arch" -> "Alpine Arc"	done
Elena Bukvareva	Chapter 4	47	1169	47	1171	Strengthening fires can be a major factor in changing ecosystems in Siberia. Fire danger is predicted to increase significantly as climate warms. Climate change would result in increased tree mortality in the southern taiga, thus increasing fire fuel accumulation. Risks of large fires would significantly escalate in southern Siberia and in central Yakutia promoting new habitats for steppe and forest-steppe rather than forests (Tchebakova et al., 2009). This reference is in the literature for Chapter 2: Tchebakova N.M., Parfenova E.I., Soja A.J. 2009. Effects of climate, permafrost and fire on vegetation change in Siberia in a changing climate. Environ. Res. Lett. 4: 045013. 10 pp.	thank you for this reference! The impact of fire risk and frequency is treated in chapter 4.5 (FOD, now 4.4 in SOD) and not here. Reference was added.
Allan Watt	Chapter 4	47	1172			Windthrow	done
Gunay Erpul	Chapter 4	47	1175	47	1178	Would the risk or trend of wind erosion as a threat esp. for coastal ecosystems be at stake?	we discussed it, but it seems to go far given the wealth of information we have to cover
Allan Watt	Chapter 4	47	1180			Presumably this will be expanded to include recent studies.	Yes, this section is expanded in the SOD
PESC-3	Chapter 4	47	1180	47	1190	section on IAS very brief, should be expanded (currently only one reference)	Yes, this section is expanded in the SOD
Germany	Chapter 4	47	1187	47	1187	Provide a reference for the EU Regulation 1143/2014: <a href="http://ec.europa.eu/environment/nature/invasivealien/index_en.htm">http://ec.europa.eu/environment/nature/invasivealien/index_en.htm</a>	done, thanks
Germany	Chapter 4	47	1188	47	1190	The scope of the Regulation 1143/2014 is "inclusion on the Union list would effectively prevent, minimise or mitigate the adverse impact of those species in a cost efficient manner". Therefore invasive species already present and wide spread are not within the scope of this regulation – which does not mean the EU legislation failed. This should be clarified.	This was included in this new version
Gunay Erpul	Chapter 4	48	1191	47	1198	EU National reports on Nitrate directive and Water directive could help!	we have much expanded this section and thank for the suggestions
PESC-3	Chapter 4	47	1191	48	1224	pollution: agrochemicals should be mentioned - by sub-regions; also cocktail effects and cumulative effects should be added	this section has been much expanded

Germany	Chapter 4	47	1191			Consider providing a reference on the outcomes of the IPBES assessment on the effects of pollutants on pollinators, pollination and food production in section 1.4.4 on "Pollution".	We have much expanded this section and also have now a section on effects from mixtures of chemicals (4.4.4.3.3), yet here, we only talk about trends in drivers (chpt. 4.3), while the effects of drivers is in chapter 4.4 in SOD (was 4.5 in FOD).
Allan Watt	Chapter 4	47	1193	47	1198	See the European Nitrogen Assessment.	Thank you for this reference! This section is much enlarged in the SOD version
PESC-3	Chapter 4	48	1206	48	1209	light pollution does have recent reviews --> see e.g. literature through the project "Loss of the night": <a href="http://www.verlustdernacht.de/literature-links.html">http://www.verlustdernacht.de/literature-links.html</a>	This section was revised in the SOD
Allan Watt	Chapter 4	48	1210	48	1224	Presumably incomplete. See e.g. the UK Review of Transboundary Air Pollution (ROTAP) <a href="http://www.rotap.keh.ac.uk/">http://www.rotap.keh.ac.uk/</a>	Thank you for this reference! This section is much enlarged in the SOD version
Gunay Erpul	Chapter 4	48	1225	48	1225	I think "natural resources exploitation" is main cross cutting chapter to be used by RA and LDRA and there is a need for significant collaboration.	We agree. We have much enlarged this section in the SOD, was too marginally treated in the FOD
Mark Sneathlge	Chapter 4	49	1228			What timescale has been considered for the future trends?	Basically the period until 2041-2060. This is now better explained in section 4.1.5.
Gregory Insarov	Chapter 4	49	1232	49	1234	References to literature, datasets, web pages and other materials should be added.	This table summarizes the whole material presented throughout the direct driver chapters. Therefore, references are already presented. The content arises from a Delphi process among CLA's and LA's. This is now better explained in section 4.1.5.
Gunay Erpul	Chapter 4	49	1232	49	1232	Table 4.5. could also require being modified after IPBES classification of biomes is introduced.	This table now follows the new "units of analyses" put forward in 2016 by IPBES
PESC-3	Chapter 4	49	1232	49	1238	Table 4.5: 1) symbols of the legend and ist colours should be reworked to improve clarity; 2) content of the table is not too well covered in/aligned with the text	This section is also revised considerably for the SOD text, following a delphi process with all CLA's and LA's of the chapter.
Marie Stenseke	Chapter 4	50	1240	83	2460	4.5-4.7 in these sections there is a strong bias towards agricultural land use, implicitly in formulations and also in examples given. Forestry has to be better included, also in Western Europe sections. Also, fishery, aquaculture (eg.the development in Norwegian fjords), transport systems, urban settlements, recreation and tourism (down hill skiing resorts, beaches, golf courses etc as well as proteted areas (10-15 % of the land in many countries - a strong trend during the last 50 years!)needs to also included. Compare with chapter 6 and the land and water uses discussed there.	The sections 4.5-4.7 were not well developed in the FOD, and are much revised for the SOD, which also follows a different structure now.
Marie Stenseke	Chapter 4	50	1240			4.5 It is unclear what is meant by 'ecosystem services' in its section about the effects of drivers. Effects on non-material benefits to people (e.g. many of the so called cultural ecosystem services) are missing - spirituality, identity, experiential benefits etc.	The chapter primarily considers effects of direct drivers on biodiversity and ecosystems, not on ecosystem services. If mentioned, these are only touched very superficially. The agreement in relation to material treated in chapter 3 is that here, only the general mechanisms of driver effects on biodiversity are treated.
Douglas Nakashima	Chapter 4	50	1240			4.5. Effects of direct drivers on biodiversity	.
Douglas Nakashima	Chapter 4	50	1240			4.5.1. Land use change Babai & Molnar 2014 (Romania): (p127) "European experience shows that extensive farming cannot be replaced by conservation treatments (Poschlod and WallisDeVries, 2002; Poschlod et al., 1998). Maintaining traditional land management can be a key factor to conserve biodiversity (Hartel et al., 2010), because traditional ecological knowledge and the associated informal institutions are more effective than direct conservation measures (Shen et al., 2012)." Encroachment of agricultural/pasture lands following abandonment/ decrease of traditional management practices: Fernández-Giménez & Estaque 2012 (Spain): (p295) from an interview with a herder: "Every afternoon in this season, in the month of October when we came down from the big mountains to the lower mountain pastures, every afternoon we would burn a juniper bush or 2 or 20, and it was noticeable, because now that 20 years have passed that they have forbidden us from burning, well [the shrubs] have grown and invaded and now it is closed with junipers." Glasenapp & Thornton 2011 (Switzerland): (p778-779) "While it is difficult to reconstruct the ecological history of alp use and maintenance, most experienced Vals farmers believe that 50–60 years ago the alps were exploited to maximum capacity, and use has since declined to the point where now it is difficult to maintain productive pasture for livestock. On most alps half the number of animals is summered in comparison to historical numbers. Farmers, especially older ones, notice more and more shrubs and small trees on the alps, a symptom of under-use more than environmental change. The visible indications of over and undergrazing are still known to the farmers, because they have to deal with the same issue on their private spring and autumn pastures. The concrete knowledge of the specific terrain of the alps, how to rotate the animals or locations of good water sources, is passed down through generations of managing the alp."	thank you for these references. We have included some examples on ILK effects into the much enlarged and revised SOD text.
Andy Purvis	Chapter 4	50	1240	51	1320	Newbold et al. (2015 Nature, and 2016 Science) provide global maps of the impact they estimate land-use change to have had on local terrestrial biodiversity by the year 2005 (2015 Nature: species richness, overall abundance and rarefaction-based richness; 2016 Science, at a finer spatial resolution, adds species-richness intactness and an abundance-based intactness measure known as the Biodiversity Intactness Index). The 2015 Nature paper also estimates the time course of changes to date, suggesting that most of the reduction came in the 20th century. Although global, these outputs could be calculated for ECA (indeed, I'm part of that team, and we would be willing to do so).	thank you for these references. We have included some examples on ILK effects into the much enlarged and revised SOD text.
PESC-3	Chapter 4	50	1241	51	1320	1) restoration should be added to the land use section; 2) literature of Teja Tschamke should be considered with regards to landscape structure and matrix effects; e.g. Tschamke, T., A. M. Klein, A. Kruess, I. Steffan-Dewenter, and C. Thies. 2005. Landscape perspectives on agricultural intensification and biodiversity - ecosystem service management. Ecology Letters 8:857-874.; review in Tschamke, T., J. M. Tylianakis, T. A. Rand, R. K. Didham, L. Fahrig, P. Batary, J. Bengtsson, Y. Clough, T. O. Crist, C. F. Dormann, R. M. Ewers, J. Frund, R. D. Holt, A. Holzschuh, A. M. Klein, D. Kleijn, C. Kremen, D. A. Landis, W. Laurance, D. Lindenmayer, C. Scherber, N. Sodhi, I. Steffan-Dewenter, C. Thies, W. H. van der Putten, and C. Westphal. 2012. Landscape moderation of biodiversity patterns and processes - eight hypotheses. Biological Reviews 87:661-685.	Thank you; we have now a new section "Restoration and rewilding" of land, and we are thankful for such references. We have already cited Tschamke for three different publications in the SOD text.
Germany	Chapter 4	50	1241			Section 4.5.1 on Land use change should also consider the relevant findings of the assessment on land degradation and restoration (IPBES deliverable 3b) for the ECA region.	There were some interactions with the LDR assessment. The difficulty is that it is developing at the same time...
Germany	Chapter 4	50	1241			Section 4.5.1 uses the term "land use" as well as "land management". Please provide the definitions for both terms and ensure alignment in use across the 4 regional assessments.	The section is much enlarged and this has been included
Mark Sneathlge	Chapter 4	50	1249	50	1251	Incomplete sentence: verb missing	This sentence no longer exists in the much enlarged and extended version of the old chapter 4.5.1
Gunay Erpul	Chapter 4	50	1255	50	1270	What happens to the under ground biodiversity and ecosystem services (soil organic matter, soil organisms) with change of land cover? Will this respect (interlinkages btw. above and under ground) be planned to cover up?	This is a weak point in our chapter 4. We do not directly treat belowground biodiversity (also called "dark diversity") as it fits rather with chapter 3. But we attempt to improve the text regardign LUC effects on belowground diversity.
Forest Isbell	Chapter 4	50	1257	50	1260	You might also cite some of the theoretical (e.g., Tilman et al. 1994 Nature) and experimental (e.g., Haddad et al. 2015 Scientific Advances) studies.	This section is much enlarged, and we already cite Tilman now for theoretical insight in few instances.
Forest Isbell	Chapter 4	50	1258	50	1258	I recommend changing 'extirpation' to 'extirpation or extinction' given that these need not be local extinctions.	This section has been completely rewritten
Forest Isbell	Chapter 4	50	1260	50	1261	Newbold et al. 2015 Nature is perhaps the best reference here.	Thanks for this reference. The section is much changed now!
Forest Isbell	Chapter 4	50	1265	50	1268	I recommend citing some of the biodiversity-ecosystem functioning studies here (e.g., Hector et al. 1999 Science; Tilman et al. 2001 Science; Gonzalez and Chaneton 2002 Journal of Animal Ecology; Tilman et al. 2006 Nature; Hector and Bagchi 2007 Nature; Isbell et al. 2011 Nature; Cardinale et al. 2011 American Journal of Botany; Cardinale et al. 2012 Nature; Isbell et al. 2015 Ecology Letters; Isbell et al. 2015 Nature).	The section is completely rewritten, but we nevertheless thank for the excellent input.
Germany	Chapter 4	50	1267	50	1270	Insert a reference on the outcomes of the IPBES assessment on pollinators, pollination and food production.	Now done!
Frederic Lemaitre	Chapter 4	50	1271	51	1286	Please consider this study by Lamarque et al where they disentangled the effects of climate and land-use change on grassland ecosystems and ecosystem services bundles, looking into the effect of different management scenarios (Lamarque P., Lavoire S., Mouchet M., Quétier F. (2014) Plant trait-based models identify direct and indirect effects of climate change on bundles of grassland ecosystem services. Proceedings of the National Academy of Sciences of the USA 111:13751-13756 )	Thank you for this input
Mark Sneathlge	Chapter 4	50	1272	50	1272	"severity" -> "intensity"?	Section has been much expended and changed, text no longer exists as such
Germany	Chapter 4	50	1279	50	1280	The IPBES assessment on pollinators, pollination and food production has provided similar conclusions on the impact of intense land-use on bee species richness. Please refer to the outcomes of this finalised IPBES assessment as well.	is now referred to
Gunay Erpul	Chapter 4	51	1287	51	1308	The effects of land use change in some restored systems other than organic farming and land abandonment on ecosystem services (provisioning services) could be worth to touch.	is now included
Forest Isbell	Chapter 4	51	1295	51	1295	I think you mean 'land sharing' rather than 'land sparing' here.	Section has been much expended and changed, text no longer exists as such
Forest Isbell	Chapter 4	51	1297	51	1299	Note also the nice European studies that sowed plant diversity (Bullock et al. 2001 Ecology Letters; Bullock et al. 2007 Journal of Applied Ecology) and that experimentally manipulated plant forage diversity (e.g., Kirwan et al. 2007 Journal of Ecology; Finn et al. 2013 Journal of Applied Ecology), and that considered interactions between plant diversity and management intensity (Weigelt et al. 2009 Biogeosciences).	Thank you for the suggestions
Marianne Penker	Chapter 4	51	1302			Land abandonment can also be seen as a major pressure affecting agro-biodiversity and social-ecological systems that have co-evolved over centuries. In most parts of Europe, land abandonment generates landscape and biodiversity-related concerns in the scientific community and among the public (Navarro and Pereira, 2012). Reviews of land abandonment literature identified the following negative consequences in order of decreasing importance: biodiversity loss, increase of fire frequency, soil erosion and desertification, loss of cultural and/or aesthetic values, reduction of landscape diversity and reduction of water provision (Benayas et al., 2007) and an overall undesirable effect on the environment (MacDonald et al., 2000). Estel et al. (2015) generated European-wide maps showing the annual extent of abandoned farmland from 2001 to 2012 (cropland and grassland) and detected an average of 128.7 million hectares of fallow land (24.4 % of all farmland). Up to 7.6 million hectares of farmland was abandoned from 2001 to 2012, mainly in Eastern Europe, Southern Scandinavia, and Europe's mountain regions. Land abandonment is related to loss of farmers and income opportunities in mountain areas, loss of bio-cultural diversity (UNESCO, 2012) and cultural ecosystem services (Daniel et al. 2012), but also in yield gaps which have to be substituted by potentially more harmful extension of agricultural land somewhere else (Foley et al. 2011)	thank you for the suggestions, we consider it for the much revised and extended material
Allan Watt	Chapter 4	51	1309	51	1320	Further assessment of the literature on forest biodiversity needed.	this section has been much enlarged in the SOD version
Forest Isbell	Chapter 4	51	1309	51	1320	You might also mention here the potential benefits of diverse tree plantings, as recently considered by TreeDivNet experiments.	This section no longer exists in the much enlarged version of the manuscript
Mark Sneathlge	Chapter 4	52	1316			Two different outcomes juxtaposed in one sentence. How do the species respond to landscape structure (more or less structure)?	ditto
Anahi Espindola	Chapter 4	51	1320	51	1320	Something could be also mentioned about the lag-times of these effects, if such information is available. In fact, some effects on biodiversity appear only after a certain time after the landscape change (discussed in Andersson et al 2010 and reviewed by Essl et al., 2015: <a href="http://dx.doi.org/10.1016/j.tree.2015.05.002">http://dx.doi.org/10.1016/j.tree.2015.05.002</a> )	This is no well mentioned in the extended text of the SOD
Allan Watt	Chapter 4	51	1321			This section is missing an assessment of the impact of fragmentation of forests and other ecosystems e.g. Habitat Loss, the Dynamics of Biodiversity, and a Perspective on Conservation (Hanski, 2011).	This section has been much enlarged. There is now a specific section on fragmentation



Douglas Nakashima	Chapter 4	55	1447		4.5.4. Pollution Niemi et al. 2004 (Faroe Islands, Denmark) : (p249) "I think that we are not in a position today that international pressure would stop us from killing pilot whales, what I find the biggest problem is pollution, why we have to stop, because the pilot whales, like everything living in the ocean, is so polluted that we cannot use for consumption and perhaps they are even threatened to extinction because of the pollution." [Hans Jacob Hermansen]	thank you for the suggestions, we did not include it.
Allan Watt	Chapter 4	55	1459	56	1489 See comments above about nitrogen and phosphorus (and note spelling of latter).	thank you for the comments
Anahi Espindola	Chapter 4	55	1459	55	1462 Increases on N content in the ground could also affect interactions between species, such as the ones established between Rhizobia and clover (see this very good study demonstrating how this type of evolution can and does happen: Weese JD, Heath KD, Dentinger BTM, Lau JA. 2015. Nutrient enrichment causes the evolution of less cooperative rhizobium mutualists. Evolution 69: 631-642, and this Simonsen AK, Han S, Reckert P, Renschler C, Heath KD, Stinchcombe JR. 2015. Short-term fertilizer application alters phenotypic traits of symbiotic nitrogen fixing bacteria.). This can affect the survival of the Rhizobia and can also have some cascading effects on other parts of the ecosystem.	thank you for the suggestion
Gunay Erpul	Chapter 4	55	1478	55	1489 Ground water pollution by N and P is also a case!	Strong point, we still need to improve on this
Frederic Lemaitre	Chapter 4	56	1490	56	1496 Furthermore, some environments enriched with N accumulated over decades, e.g. peatlands, even at modestly elevated levels, may be poised to change rapidly should the environment become more favourable for the invasion of grasses and shrubs through warming and drying. As these vascular plants sequester far less carbon over the long term than peat-forming Sphagnum, the key peatland quality of removing and storing carbon over hundreds or thousands of years would be lost if this occurred (see (Field C.D., Dise N.B., Payne R.J., Britton A.J., Emmett B.A., Hellwell R.C., Hughes S., Jones L., Lees S., Leake J.R., Leith I.D., Phoenix G.K., Power S.A., Sheppard L.J., Southern G.E., Stevens C.J., Caporn, S.J.M. (2014) The role of nitrogen deposition in widespread plant community change across semi-natural habitats. Ecosystems 17:846-877 + Wu Y., Blodau C., Moore T.R., Bubier J., Jutinen S., Larmola T., (2015) Effects of experimental nitrogen deposition on peatland carbon pools and fluxes: a modelling analysis. Biogeosciences 11:1-23 + Kuiper J.J., Mooij W.M., Bragazza L., Broek B.J.M. (2014). Plant functional types define magnitude of drought response in peatland CO2 exchange. Ecology 95(1):123-131)	thank you for the suggestion
Anahi Espindola	Chapter 4	57	1497	57	1497 I recommend making the dots smaller, so that they don't overlap that much in regions with a lot of coastal studied sites.	This is a graph from an existing publication
Mark Snethlage	Chapter 4	56	1499	56	1499 Source?	We have improved reference to sources in figures. Still needs improvement
Violaine Brochier	Chapter 4	57	1513	58	1528 Even if ecotoxicity of individual compounds can be documented, it is very difficult to have an idea of the effect of contaminants mixture on individuals or on population. The questions of cocktail effect and low dose effect are important but very hard to investigate.	we agree
Santosh Kumar Mishra	Chapter 4	58	1529			Section has been expanded
PESC-3	Chapter 4	58	1558	58	1558 are the percentages regarding nocturnal vertebrates and invertebrates are correct? Please revise	thank you for this point
Mark Snethlage	Chapter 4	59	1569	59	1569 Repeated from line 1558	now clear
Mark Snethlage	Chapter 4	59	1569	59	1605 Merge with the first paragraph of " Other pollutants" (1575 - 1580) which partially overlaps	This section was rewritten and improved
Germany	Chapter 4	59	1575	59	1581 Doubling to lines 1596-1600 same page! Lines 1575-1581 should be deleted.	deleted and improved
Violaine Brochier	Chapter 4	59	1575	59	1589 Are we talking about thermal pollution ? If yes, it can be put in the "thermal pollution" text L1596-1606	yes, it is included
Mark Snethlage	Chapter 4	59	1590	59	1594 This section is about the effects of drivers on biodiversity, while the paragraph talks about the status and trends of the driver (acidification). This paragraph would therefore be more appropriate in the previous section on trends.	We have now section 4.4.4.1.3 much enlarged into a new section structure
Mark Snethlage	Chapter 4	60	1608	60	1613 This paragraph gives some general information about the relation between noise pollution and biodiversity, but no specific figures for the ECA region	This has not yet been done
Violaine Brochier	Chapter 4	60	1614	60	1620 Pollution from mixtures : this paragraph could be added previously, with the thematic of chemical pollutant. It is not well adapt to talk about it after noise and light pollution	This paragraph is enlarged now
Mark Snethlage	Chapter 4	60	1615	60	1620 Idem. Very general statements, but nothing specific about the ECA region	This section is now extended
Douglas Nakashima	Chapter 4	60	1621		4.5.5. Natural resources exploitation Agnoletti 2006: (p19) "At the global level modern forestry has resulted in an increase in forest plantations, accelerated the loss of traditional knowledge and has favoured simplified forest landscape patterns, often creating conflicts with local populations, and reduced attention to offer a alternative perspectives and approaches towards the role and the use of trees (Arnold and Dewees 1995)." Bürgi et al. 2013 (Switzerland): (p115) "In many parts of the world, TFRK (traditional forest-related knowledge) today is disappearing rapidly, which goes parallel to the development of modern forestry and a decrease in dependency of societies from their local forest resources (for Europe e.g., in Johann et al. (2012)). (p118) "An interviewee recalls the resulting forest structure [resulting of pollarding the needles of conifers] as being beneficial also for the capercaillie (Tetra urogallus), which is today a red listed species in Switzerland. The manure from needle litter was collected on a separate pile and specifically used to fertilize potato plots. This needle-manure had to be ploughed into the soil and it was said to have a positive effect on soil structure, as it brought air into the otherwise heavy loamy soils of Fankhausgraben. There even is a saying that manure from the forest makes the soil "proud", i.e. productive ("Mist von Holz macht Boden stolz") (details in Stuber and Bürgi (2011))."	thank you for the suggestions, we still have not decided on what to do with this and similar comments. We plan to make boxes in the final draft.
PESC-3	Chapter 4	60	1623	73	2121 ILK issue should be expanded and clarified, some key references are missing; traditional landscape changes are missing as drivers	Traditional landscape changes has been given a new section, 4.5.5.
PESC-3	Chapter 4	60	1623	73	2121 loss of experience (knowledge erosion) is a problem in Europe - that should be mentioned somewhere as a driver	Newly addressed in 4.5.5
Douglas Nakashima	Chapter 4	60	1623		4.6. Status and recent trends in indirect drivers	-
Douglas Nakashima	Chapter 4	60	1623		ADD role of sacred sites as direct and indirect driver, Sezdebek and Aibek 2016 (Kyrgyzstan): Informal institutions such as sacred site guardians can be both direct and indirect driver for preserving BD on sacred sites in Kyrgyzstan. They make sure visitors observe the rules and taboos on sacred sites (thus, ensuring direct conservation of BD on sacred sites) as well as spread and uphold traditional values and worldviews, which promote harmonious co-existence with nature (thus, indirectly contributing to BD conservation).	Addressed in the section related to traditional land use.
Marie Stenseke	Chapter 4	60	1625		In the section 4.6.1. a good source for giving overview is: Emanuelsson, U. (2009). The Rural Landscapes of Europe: How Man Has Shaped European nature. Formas, Stockholm	We had a look at this but found it hard to use.
Douglas Nakashima	Chapter 4	60	1625		4.6.1. Status and recent trends in indirect drivers of land use change	-
Douglas Nakashima	Chapter 4	60	1627		Institutional, economic and technological drivers - Demeter 2016 (Ukraine): strong indirect factors that drive the use of forest ecosystem services: lack of forest workers, economic influences, corruption, local attitudes. zFernández-Giménez & Estaque 2012 (Spain): (p288) "With the advent of the Common Agricultural Policy (CAP) for the European Union, pastoralists face declining competitiveness and rising production costs, with the result that EU agro-environmental subsidies account for an increasing proportion of their livelihoods, rather than income from the sale of their livestock products (Garcia-Martinez et al. 2009). These factors have resulted in the abandonment of previously grazed pastures, which are reverting from herbaceous vegetation cover to shrublands and forests. These changes in land cover in turn may affect the ecological function and ecosystem services provided by these lands, and are associated with a decline in biodiversity (Vicente-Serrano et al. 2004; Lasanta-Martinez et al. 2005; Lesschen et al. 2007)." Iniesta-Arandia et al. 2014: (p2) "Lastly, the Mediterranean mountain and semi-arid systems are among the most vulnerable ecosystems in the Iberian Peninsula to climate change and land-use change (EME 2011). Regarding the latter, since the 1950s, the integration of local economies into global markets triggered agriculture mechanization and intensification in areas where it was feasible, generally lowlands (Naredo 2004). In geographically disadvantaged areas, the possibilities of younger people finding a job drastically diminished as traditional agriculture was no longer competitive. This entailed the process of depeasantization—i.e., the erosion of an agrarian way of life mostly based on family labor—and a subsequent rural exodus—i.e., outmigration of rural population to urban areas (Sevilla Guzmán 1979). Thus, rural communities are currently composed of an aging population with a lack of generational renewal (see Table S1 in Supplementary Material). Ecologically, this process has led to the lining and burial of the acequias to obtain higher water yields (Espri et al. 2010) and a reduction in crop diversity." Novikova & Yatimov 2011 (Tajikistan): (p47) "There is a very urgent problem of life-support for local, mostly very poor, people living in mountainous forest areas who are directly dependent on forest products for their livelihoods. As population growth, and poverty, in mountain areas increase so does forest exploitation for short-term economic benefit, since there are currently few if any alternatives for economic development aside from exploitation of natural resources. Outstanding issues and disputes related to land utilization in forest areas creates conflicts between local administrations and people which complicates state control and enforcement of environmental and forestry legislation."	These and similar traditional land use issues are assessed in the new section 4.5.5
Anahi Espindola	Chapter 4	60	1628	60	1645 have there been differences in the different regions of the area? That is, are there some areas that seem to have their land use change more often due to certain indirect drivers versus other regions that are more affected by other indirect drivers?	We have increased the resolution by analysing indirect drivers of changes in different type of land uses such as forestry, agriculture, nature protected area, traditional land use and urban development. Therefore, differences are not only among sub-regions but also among drivers related to different types of land use.
Anahi Espindola	Chapter 4	60	1643	60	1643 regime shifts', are you referring to land use regimes? Please, state so if that's the case. In fact, right before you mention political drivers, and initially I thought that you were talking about political regimes... or maybe you were?	It is about political regime. The loss of semi-natural grasslands in Hungary during the regime shift from communism to capitalism between 1987 and 1999 was found to be very high (1.31 % per year), which is far higher than either before or after this period' (page 29)
Marie Stenseke	Chapter 4	61	1649		4.6.1 Demographics: The issue of demography needs to consider contemporary patterns in our urban and mobile society, where travels, including tourism and the phenomena of secondary homes makes the demographic patterns much more complicated than is shown by statistics of permanent inhabitants. Hence, areas that are seasonally quite deserted are hugely populated other times of the year, e.g. coastal resorts, ski resorts. There are also more long-term seasonal migration waves to areas with milder climate, and also from cities to less densely settled areas during summer time. These are all phenomena that has grown in the past 50 years.	We have addressed coastalisation and urbanisation and ruralisation in different part of Europe. Also tourism both here and under natural resource extraction of water.
Mark Snethlage	Chapter 4	61	1654	61	1654 "with c. 1270 people per square km" should read "with c. 127 people per square km": population density figure is a factor 10 too high (latest data from wikipedia suggest 112 people per km2 for the region)	This text was removed.
Allan Watt	Chapter 4	61	1659	61	1674 Sources / references needed.	Was added.
Anahi Espindola	Chapter 4	61	1659	62	1698 These paragraphs don't have any citations.	The text was modified much, and this paragraph does not exist any more.
Allan Watt	Chapter 4	62	1685	61	1692 Information on trends would be more useful than statements on current migration rates, given that migration rates may be changing.	The text was modified.

Marie Stenseke	Chapter 4	62	1699	62	1719	The reasoning on urban rural needs to be nuanced. There is a vast literature on the problematic dualism urban-rural in urban and mobile societies, see e.g. Champion, A. & Hugo, G. (2004). New forms of urbanization: Beyond the urban-rural dichotomy. Hants: Ashgate; Woods, M. (2009). Rural geography: blurring boundaries and making connections. Progress in Human Geography, 33(6), 849-858.	We will look into this after the SOD, we could not do it before, I'm afraid.
Allan Watt	Chapter 4	62	1703	63	1724	Sources / references needed.	Added
Anahi Espindola	Chapter 4	63	1722	63	1724	This paragraph gives the impression that rural populations are more aware of the ecosystem than urban populations. However, what does this mean? The 'ecosystems' are different for these two populations, and both are equally aware of their own ecosystem (the countryside and the city, respectively). This sentence can be also interpreted as an indicator that rural populations are more 'environmentally friendly' than urban populations, although I wonder how much that has been scientifically demonstrated and how much it carries the romanticism associated to the rural life. If this type of paragraph is going to appear in the report, I think that it has at least to be more developed and properly referenced.	This paragraph was removed.
Anahi Espindola	Chapter 4	63	1722	63	1740	Are there any informations of how religions can affect the spatial distribution of land uses? For instance, are there any informations of certain restrictions in terms of land use/management, related to religious requirements, like conditions for a product to be halal or kosher (for instance) that require certain land use/management practices, that would finally also affect land use at larger scales? In the same lines, are there religions in the area that have taboo or holly regions, that have thus to be maintained or kept wild or untouched?	This is addressed in the new section 4.5.5 Traditional land-use
Allan Watt	Chapter 4	63	1725	63	1740	More sources of information (than Pope Francis I) needed.	This part that was presented Cultural and religious drivers was re-written. See 590-601 with references of peer-reviewed publications.
Anahi Espindola	Chapter 4	63	1725	63	1734	I guess I'm a bit confused what 'cultural' means in this section, and how it relates or equates 'religion'. The fact that the Pope made these declarations has certainly an effect on the Catholic part of the population, and thus I see how this can be a religious effect. In fact, the Pope is the representative of God on Earth and is infallible, so these declarations can't be really argued by believers. However, I don't understand how this is a cultural driver... since it affects only a part of the population... but again, religion is a part of culture, so maybe I'm just trying to pull apart things that shouldn't. Also, and independently of these definitions of culture v. religion, are there any informations on direct effects of these declarations on changes in land use/land management, or consumption patterns, for instance?	We agree with this comment. The reference to Pope was removed. We explained cultural and religious drivers is following "These include values, beliefs and social norms that a group of people share and that have the most influence on decision making about the environment (Nelson et al., 2006). Culture conditions the individual's perceptions of the world, influences what he or she considers important (including economic preferences), and suggests courses of action that are appropriate and inappropriate. Although culture is most often thought of as a characteristic of national or ethnic groups, this definition also acknowledges the emergence of cultures within professions and organizations, along with the possibility that an individual may be able to draw on or reconcile more than one culture (Nelson et al., 2006). These are materially manifested in their lifestyles and consumption patterns. To enable transitions to sustainability cultural drivers such as social capital may be mobilized by trust-building (Pretty 2003). These norms are further strongly influenced by education and knowledge as a part of the awareness of present threats to global climate, biodiversity and ecosystem services". We agree that there is a lack of arguments related to religious as indirect drivers. This will be addressed in the final version of SOD.
Gunay Erpul	Chapter 4	63	1736	63	1736	"resonate"	Done
Germany	Chapter 4	63	1742	69	2005	Please critically cross-check and ensure that that this section of the chapter (which includes the sections 4.6.1.2; 4.6.1.3; 4.6.1.4 and 4.6.1.5) is not overemphasizing some historic events, thereby paying less attention to other events. It must be ensured that a balanced view is provided.	The whole section 4.6 has been exploded and the pieces have been moved under the Direct drivers sections, to get more integrated assessment of direct and indirect drivers.
Allan Watt	Chapter 4	63	1743			Repetition.	Deleted
Germany	Chapter 4	63	1755	63	1755	Provide the reference for the "Council Regulation (EC) No 1782/2003: <a href="http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003R1782&amp;from=EN">http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003R1782&amp;from=EN</a>	Done
Mark Snethlage	Chapter 4	64	1782	64	1782	"viscos" -> "viscose"	the text was modified
Douglas Nakashima	Chapter 4	64	1788			4.6.1.3. Western Europe Niemi et al. 2004 (Faroe Islands, Denmark) : (p247) "[...] changes in the Faroese culture can be seen. Rene Hansen tells about the change from his point of view as a bird catcher. "It's [puffins] the same as the pilot whaling, now it doesn't have so much meaning, but in the past it was very important. And that's much the same about pilot whaling, it is not so today... we can eat anything else, but it is just the culture [why] we kill. And some people like very much, old people, but younger generation... I think, 50 years and we not kill whales anymore, make the same with the puffins, we are not catching them anymore. We change, the culture [is] changing." [Rene Hansen]	Unclear what is required
Mark Snethlage	Chapter 4	64	1800	64	1800	"disintensification" -> "extensification"?	We use a term 'disintensification' when it is used in referenced papers
Anna Augustyn	Chapter 4	65	1822	67	1899	It would be worth to add that agricultural diversification / multifunctional agriculture has been intensively promoted with the EU accession, as well as new governance models for rural areas which often encountered difficulties in application (for references see e.g. Augustyn, Anna, and Guszáv Nemes. "Catching up with the West?." Studies in Agricultural Economics 116 (2014): 114-121.)	It is partly addressed as following "There have been changes in land management and farm diversification following societal and demographic shifts to a more urbanized European population (Beilin et al., 2014; van Vliet et al., 2015)". In the SOD we have expanded the assessment of agriculture (4.5.2)
Douglas Nakashima	Chapter 4	65	1822			4.6.1.4. Central Europe Babai & Molnár 2014 (Romania): (p124) "In the Gyimes part of the Eastern Carpathians, abandonment [of pastoral lands like hay meadows] became a major factor only in the last five years. The process is driven by economic and demographic changes occurring at local and regional change, but it is also fostered by some agri-environmental subsidy schemes, their extreme bureaucracy and the strict regulations on dairy production implemented by the European Union."	This reference was used.
Germany	Chapter 4	65	1843	65	1844	"The excessive use of fertilizers caused eutrophication of many surface waters."	The text was re-written and this sentence does not exist any more.
Germany	Chapter 4	66	1851	66	1851	Regarding the bracketed text: When talking about "East Germany" in terms of the formerly German Democratic Republic, please use the term "former East Germany".	We changed into German Democratic Republic as it was in 1980.
Zsolt Molnar	Chapter 4	66	1866	66	1874	Biró et al. 2013 is cited but missing from the references	Included. Biró M., Czúcz, B., Horváth, F., Révész, A., Csatári, B., Molnár, Z. (2013). Drivers of grassland loss in Hungary during the post-socialist transformation (1987-1999). Landscape Ecology 28: 789-803.
Gregory Insarov	Chapter 4	67	1902	67	1902	This section is biased, it is mainly about arm conflicts.	This section was re-written. Armed conflicts are shortly presented as indirect drivers in the category of institutional drivers. This sub-chapter is under development. We have 12 new contributing authors who are gathering data to provide analysis of indirect drivers of changes in agriculture, forestry, protected area development, urban development and traditional land use. Will be finished during the workshop in Turkey in the end of January.
Elena Bukvareva	Chapter 4	67	1902	67	1902	Change the subtitle to "Institutional drivers" as "Economic drivers" goes on further in the text (see the line 2038)	See the previous comment
Elena Bukvareva	Chapter 4	67	1902	67	1902	It is advisable to add in this section the following paragraph: The Russian state forest protection service have not enough funds and resources to extinguish fires in the vast territories of the northern Russia and Siberia. For example, in October 2015 Russian Ministry of Natural Resources allowed do not put out fires in remote inaccessible forests, if these fires do not threaten human settlements and economic facilities ( <a href="http://docs.cnd.ru/document/420310212">http://docs.cnd.ru/document/420310212</a> ). The quarter of all Russian forests and 86% of forest of the largest region of Siberia - Yakutia (220 million hectares) meet these criteria.	Unfortunately this comment was not addressed yet. We did not receive the text on the Russian forestry yet from a new CA, it was promised to be delivered in April.
Gregory Insarov	Chapter 4	67	1915	67	1916	There is no references corresponding to (ROSSTAT 2014, UKRSTAT 2014, KAZSTAT 1915 2014) in the reference list.	The references had been added.
Mark Snethlage	Chapter 4	67	1931	69	2005	A general analysis of armed conflict and land use with many examples from outside the ECA region. Perhaps not that relevant in a discussion about drivers in ECA. This part should perhaps better be summarised, as the level of detail is not in line with the depth of discussion of other indirect drivers.	This section was re-written in order to address this comment. Now armed conflicts are briefly presented as following "Armed conflicts have been a significant institutional driver in Eastern Europe and Central Asia. These have had numerous consequences for people's lives and livelihoods and also affected the environment potentially for decades and centuries (well established). Local effects are directly related to the conflict and can result in increasing pressure on land use, for example in the form of illegal logging, mining, and poaching due to a lack of enforcement by local authorities. However, land-use activities can also decrease in combat zones when people are engaged in fighting or are forced to flee, causing high rates of farmland abandonment and the destruction of settlements. (4.6.1)". However, sadly this driver is becoming increasingly important. If we find more literature, we will present this driver in a more comprehensive way.
Sigrid Kusch	Chapter 4	69	2000	70	2033	The text is difficult to follow and seems not complete or should be re-written. "Our results suggest ... in our study area" (compared to other regions in the former socialist bloc) - what is meant here with 'our study area'? Another unclear section is in line 2029 onwards, where it says that "this article presents a synthesis ... based on data compiled from expert opinion and remote sensing data." - did you assess such data for this report?	The text was re-written
Anahi Espindola	Chapter 4	69	2001	69	2005	It is my understanding that this report should not be written using research publications vocabulary, but would just report on results obtained and already published. If this is correct, please refrain from using mentions such as 'our results', and just report the results and their meaning.	This section was removed.

Elena Bukvareva	Chapter 4	70	2007	70	2023	I propose to correct and add the following blocks and arrows to the Fig.4.31: 1) it seems, that the block of land use change "livestock collapse; widespread croplands" should be "livestock collapse; cropland abandonment"? 2) rename the block of land use change "Increased intensity of logging..." in the "Increased intensity of use of bioresources, including logging"; 3) add the block of land use change "disturbance of ecosystems because of extraction of oil, gas and other minerals"; 4) add demographic driver "Depopulation and aging of villages" that affects the block "livestock collapse; cropland abandonment"; 5) add institutional driver "the lack of state control over the nature protection and the use of biological resources and forests" that affects the block "Illegal logging, poaching..."; 6) add economic driver "economic crisis" that affect the blocks "Illegal logging, poaching..." and "Increased intensity of use of bioresources, including logging"; add economic driver "Resource (commodity) economy" that affects the blocks "Increased intensity of use of bioresources, including logging" and "disturbance of ecosystems because of extraction of oil, gas and other minerals"	This Figure was removed. We aim at developing causal-loop models that will show connections among indirect and direct drivers in all sub-regions of ECA after two writing workshops in January 2017.
Gregory Insarov	Chapter 4	70	2029	70	2030	Is this an article? Authors may wish to add quotation.	The reference is still missing. We made a remark in the text to add the missing reference.
Allan Watt	Chapter 4	70	2029	70	2037	Sources / references needed. "This article" suggests the text has been taken from a paper.	See the previous comment
Mark Sneath	Chapter 4	69	2029	69	2037	This paragraph appears without proper introduction and starts with a very general statement.	The structure of the chapter had been changed. There is a special section on Land Use change that includes also all indirect drivers of land use changes in subregions.
Anahi Espindola	Chapter 4	70	2029	70	2037	I guess this will be changed in coming versions, but as stated, it reads as a very odd piece of text.	The structure of the chapter had been changed. There is a special section on Land Use change that includes also all indirect drivers of land use changes in subregions.
Elena Bukvareva	Chapter 4	70	2038	70	2038	It is advisable to add in this section the paragraph about the negative influence of the extraction of oil, gas and other minerals.	See the text in 412 row
Mark Sneath	Chapter 4	70	2038	70	2038	This section is called "Economic Drivers" after a section titled "Institutional and economic drivers" (line 1902)	The text was edited.
Germany	Chapter 4	71	2048	71	2052	Provide references for all numbers cited in these lines.	There is a reference (Acharid et al. 2006)
Germany	Chapter 4	71	2055	71	2055	Insert the term "areas" in the caption of Table 4.7.: It should read: "...Table below shows burned areas in Russia ..."	Edited.
Frederic Lemaitre	Chapter 4	71	2065	71	2072	Please consider mentioning global trade in this paragraph, for example for its role in e.g. spreading IAS is demonstrated (see for example Olson D.H., Aanensen D.M., Ronnenberg K.L., Powell C.I., Walker S.F., Bielby J., Garner T.W.J., Weaver G., The Bd-Mapping group, Fisher M.C.* (*equal contributors) (2013) Mapping the global emergence of Batrachochytrium dendrobatidis, to include chytrid fungus. PLoS ONE 8(2):e56802 and also Fisher MC, Garner TWJ (2007) The relationship between the introduction of Batrachochytrium dendrobatidis, the international trade in amphibians and introduced amphibian species. Fungal Biol Rev 21: 2–9. doi: 10.1016/j.fbr.2007.02.002)	We have not decided yet whether to include this or not.
Anahi Espindola	Chapter 4	71	2069	71	2070	There is something missing in this sentence... as it reads, it doesn't make sense.	The text in this sub-chapter was re-written completely.
Germany	Chapter 4	71	2070	71	2070	Insert a reference on the EU Regulation 1143/2014	Remains to be done
Elena Bukvareva	Chapter 4	71	2076	71	2076	I propose to add the following paragraphs: 1) After the collapse of the Soviet Union governmental bodies controlling the use of biological resources and forests are in a state of permanent reform. Allocated funds are insufficient for their work over large areas of Russia. State control is weakened. The share of corruption schemes in the use of biological resources and natural areas is large. Under these conditions, the proportion of IUU (illegal, unreported and unregulated) exploitation of some bioresources and illegal logging in some regions is quite high. This leads to over-exploitation of some ecosystems and commercial populations, poaching, and the fact that profit from the use of these bioresources and timber bypasses local budgets and enriches only a small group of people involved in illegal nature exploitation.	Unfortunately this comment was not addressed yet. We did not receive the text on the Russian forestry yet from a new CA, it was promised to be delivered in April.
Allan Watt	Chapter 4	71	2077	72	2087	Sources / references needed.	Remains to be done
Mark Sneath	Chapter 4	72	2081	72	2087	Difficult to understand	Has been revised
Mark Sneath	Chapter 4	72	2090	72	2103	Difficult to understand	We do not agree. The text is clear
Marie Stenseke	Chapter 4	73	2123			4.7 There is not much of references in this section. There is a vast literature on landscape studies that should be considered, e.g. research related to the European Landscape Convention, and also to tourism and recreation trends, to the future of the rural landscape, to amenity farming, etc. see eg.Agnoletti, M. (2014). Rural landscape, nature conservation and culture: Some notes on research trends and management approaches from a (southern) European perspective. Landscape and Urban Planning, 126, 66–73; Naveh Z. (1995). Interactions of landscapes and cultures. Landscape and Urban Planning, 32, 43–54.; Plieninger, T., Höcht, F., & Spek, T. (2006). Traditional land-use and nature conservation in European rural landscapes. Environmental Science and Policy, 9, 317–321.; Rotherham (Ed.) 2013, Cultural severance and the environment, the ending of traditional and customary practice on commons and landscapes managed in commons. Dordrecht: Springer. H. Palang, G. Fry (Eds.) 2003, Landscape interfaces. Cultural heritage in changing landscapes, Dordrecht: Kluwer Academic. the following journals: Landscape research, Journal of Rural Studies,	Have not been included yet.
Douglas Nakashima	Chapter 4	73	2123			4.7. Projected trends in indirect drivers "ILK: we summarize the ILK and regional stakeholder perceptions, where available (evidence drawn from social science literature including oral histories and cultural representations e.g. art) with regard to projected trends. We discuss how worldviews change and how this may affect the trends in drivers." EXAMPLE: Lavriller 2013: (p266) : "(...) faced with the potential impossibility of exploiting the natural environment by traditional economies in the future, some Tungus have also found some unexpected solutions for their survival. (...) some Kamchatka Even informants consider ethno-tourism to be the ideal modern mode of exploitation of the natural environment for the future, because in contrast to hunting, herding, fishing or mining, ethno-tourism uses only the immaterial resources of the environment and does not exhaust the material ones. Let me point out that in this case, the perception of the environment has been changed toward a space that humans must not exploit either by extractive industries or by traditional economics; in other words a space from which humans must not directly take material resources (money from tourism is an indirect income from the environment)."	Has not been used yet.
Mark Sneath	Chapter 4	73	2124	73	2124	"Casual Loop Diagram (CLD)" should read "Causal Loop Diagram (CLD)", i.e. "causal", not "casual"?	Edited
PESC-3	Chapter 4	74	2138	74	2155	Text & Figure 4.33 might be too normative in the sense that they promote decoupling - while there is not enough evidence for it	Was removed.
Anahi Espindola	Chapter 4	74	2139	74	2139	GDP* has to be defined... I may have missed it, but I don't know what this stands for.	Gross Domestic Product. See Abbreviations in 4.1.6
Sigrid Kusch	Chapter 4	74	2143	74	2155	The discussion of decoupling is not fully consistent, including the Figure 4.33. Note the two different concepts of 'impact decoupling' and 'resource decoupling'. Certainly, both impact decoupling and resource decoupling are required when advancing towards more sustainable systems. With view to ecosystem services, impact decoupling would be required rather than resource decoupling, and SDG target 8.4 also refers rather to impact decoupling. Impact decoupling does not necessarily occur with resource decoupling and vice versa, see e.g. UNEP-Report "Decoupling natural resource use and environmental impacts from economic growth" (2011) (available online, <a href="http://www.unep.org/resourcepanel/KnowledgeResources/AssessmentAreasReports/Decoupling/tabid/133329/Default.aspx">http://www.unep.org/resourcepanel/KnowledgeResources/AssessmentAreasReports/Decoupling/tabid/133329/Default.aspx</a> ). Interesting in the context of biomass and economic growth is that biomass stands out from other resources in the way that it is characterised by economic inelasticity - GDP growth is not coupled to increasing biomass use, i.e. biomass use cannot be studied under the decoupling approach. (Biomass use is primarily linked to population numbers.)	This was addressed as following "Since the 1950s, global GDP has expanded nearly 20-fold while inputs of resources from natural systems and outputs of waste back into those systems "only" have increased about 7-fold (Homer-Dixon et al. 2015). This may be referred to as a "relative decoupling" between GDP and natural resource degradation. However, relative decoupling cannot be the basis for sustainable growth, which the EU Commission aims for (EC 2016). There is a global consensus for the Sustainable Development Goals (SDGs) (UN 2015). The biodiversity-related SDGs (#13 Climate change, #14 Marine resources, #15 Terrestrial ecosystems) all require reduction in resource exploitation and degradation. Therefore, if countries aim for economic growth, they must aim for absolute and sufficient decoupling, especially the high-income countries (Raworth 2014). The SDG Target 8.4 only requires governments to "endeavour" decoupling; this is obviously a low ambition. By definition, economic drivers will have a negative effect on ecosystems unless countries succeed in absolute and sufficient decoupling".
Germany	Chapter 4	74	2153			Fig. 4.33 Definitions of the terms "relative decoupling"; "absolute decoupling" and "sufficient absolute decoupling" are required.	Done in section 4.3 (Indirect drivers) and 4.4 on Natural resource extraction.
Mark Sneath	Chapter 4	74	2158	74	2161	"Although the total population in Europe is currently growing, most of the demographic parameters (low fertility rates, aging populations, growing importance of migration) suggest that the population will decline in the next few decades." Souldn't this be: "Although the total population in Europe is currently growing, most of the demographic parameters (low fertility rates, aging populations) suggest that the population will decline in the next few decades, in spite of the growing importance of migration."? It depends if the migration refers to net immigration or emigration...	The text was completely re-written
Germany	Chapter 4	75	2181	75	2195	We urgently request the authors to use up to date publications on the issues linked to fertility rates in Europe (e.g. Eurostat,...). It is not sufficient to base the assessment on this issues on just a few outdated publications or on one or two opinions. A more diverse discussion is needed here. Regarding lines 2181-2183: the term "unlikely" is rather an assumption. As the term reflects doubt, the conclusion in the following sentence may also have to be provided as a form of possibility. Therefore, replace "will" with "may". The sentence should read: "... As a consequence, European countries may be able to maintain or increase their populations only through immigration ..."	Section has been rewritten. We still need to update refs.
Germany	Chapter 4	75	2187	75	2187	Please delete "the": "...the area of the former East Germany will..."	Deleted
Allan Watt	Chapter 4	76	2221	77	2269	Sources / references needed.	This part was removed.
Anahi Espindola	Chapter 4	76	2221	76	2235	these paragraphs have no citations. Please add when stating your arguments.	Has been deleted
Marianne Penker	Chapter 4	76	2233		2233	Apart from consuming goods, the consumption of services (such as wellness, consulting...) and leisure time or receiving acknowledgement for voluntary action for a common cause (e.g. nature conservation volunteers) could be mentioned.	Good point. If we find references we will address it.
Allan Watt	Chapter 4	76	2248	76	2248	Speculative and not relevant to the assessment.	This sentence was removed
Germany	Chapter 4	76	2248	76	2252	The following sentence does not allow for a balanced perspective on cultural and religious aspects: "Despite the increasing secularization, ECA is at the forefront of the growing clash between western Christian noosphere and growing Islamic fundamentalism". Please consider removing this sentence. Please consider revising the whole para.	This para was removed.
Douglas Nakashima	Chapter 4	78	2278			4.7.1.5. Science and technological drivers/ BOX Indigenous Local knowledge (ILK) "ILK is the local knowledge that is unique to a culture or society. Also known by other terms, such as folk knowledge or traditional knowledge it stratified and passed on as unwritten culture over many generations. ILK encompasses information commonly known only within a community, as well as knowledge which may be known only to particular individuals, such as tribal elders. ILK can be particularly important for landscape and biodiversity conservation. Much of the ECA's biodiversity is located in areas which have been populated by indigenous peoples for centuries, and it is through their land use practices that many species spread around or survived in a given area. Local people can also provide valuable information on current, past and potential uses of species, husbandry methods, ecosystem conservation procedures and traditional classification systems". AND local people can provide not only information on USE of species, but also knowledge on biodiversity, ecosystems, changes, dynamics, drivers...	The suggested sentence was added.

Germany	Chapter 4	78	2278			Box on Indigenous Local Knowledge (ILK). Please ensure that the definition/explanation provided for ILK aligns with any definition/explanation provided by the IPBES Task Force on ILK.	The section related to ILK was checked by the ILK expert.
Zsolt Molnar	Chapter 4	78	2278	78	boxx	Box: The definition is not needed. Case 2: Please consult with some ILK experts to improve the text with relevant information	The consultation was held.
Germany	Chapter 4	78	2281	78	2288	It is surprising to find the European Union G2. Please also consider the title given for section 4.6.2.2: European Union, Western and Central Europe (page 71, line 2065).	Was addressed. Now EU (WE), CE, EE and CA.
Germany	Chapter 4	79	2291	83	2460	The sizes of the sections "4.7.2.2 Western Europe", "4.7.2.3 Central and Eastern Europe" and "4.7.2.4 Central Asia" are entirely disproportionate. Surely, there should be some more data, publications, country examples available in Central and Eastern Europe and in Central Asia to widen the scope of discussions on trends in indirect drivers for these two sub-regions as well.	These sections have been completely rewritten with a much better balance, see new section 4.3 and the empirical section on LUC 4.5
Sigrid Kusch	Chapter 4	79	2292	79	2297	Generally, the topic of bioenergy could have been covered in more detail in the report. It is good to have at least this short paragraph about bioenergy included here. At least a short explanation should be provided how energy crops influence biodiversity - such an explanation could be provided here or in another section of the report.	There is a section on bioenergy.
Anahi Espindola	Chapter 4	79	2298	79	2298	What does 'creative destruction' mean? It is unclear to me what is being meant here.	Removed
Petr Petrik	Chapter 4	80	2298	80	2304	Duplicate article	The text was re-written
Allan Watt	Chapter 4	79	2305	81	2385	Rather detailed and speculative in places (without supporting evidence).	This part was moved to the box and serves as an example.
Mark Snethlage	Chapter 4	79	2315	80	2376	This seems to be very detailed account of one study. Better to summarise?	Done
Allan Watt	Chapter 4	81	2386	81	2392	Repetition: see lines 2298-2304.	The text was re-written
Anahi Espindola	Chapter 4	81	2386	81	2392	this paragraph is repeated.	The text was re-written
Germany	Chapter 4	81	2386	81	2392	Doubling to lines 2298-2304 on page 79! Lines 2386-2392 on page 81 should be deleted.	The text was re-written
Petr Petrik	Chapter 4	81	2386	81	2392	Duplicate article	Unclear what it means.
Germany	Chapter 4	81	2391	81	2386	This paragraph is a copy-and-paste duplication of the paragraph on page 79, lines 2298-2304. Please remove.	Was removed
Mark Snethlage	Chapter 4	81	2397	81	2398	This sentence seems to have little relation with the rest of the paragraph. Better integrate it in the next paragraph?	Done
Mark Snethlage	Chapter 4	81	2406	81	2407	It would be interesting to know the figure at present in order to have an idea of the projected growth of the tourism sector. Without a reference, the figure of 350 million does not say very much more than that it is massive.	We did not find this
Germany	Chapter 4	81	2407	81	2408	The environmental impacts of tourism provided in this sentence do not quite match with the opportunity that tourism may also provide, as sketched on page 76, lines 2236-2238. Please expand on this issue.	We need to work on this after the SOD
Marianne Penker	Chapter 4	81	2408	2408	2408	The environmental impacts of tourism are far reaching, on the other hand tourists in the Alps, in coastal areas or at lakes are looking for "healthy" ecosystems and beautiful, diverse landscapes.	It is based on the references, and related to mass-tourism in the Mediterranean Region
Mark Snethlage	Chapter 4	83	2442	83	2460	These paragraphs seem very short in comparison to the previous one	This part was expanded.
Zsolt Molnar	Chapter 4	83	2442	83	2451	This text is of very poor quality. Please consult also ILK experts to replace the text with relevant information	Agree. We have consulted Zsolt Molnar and added a section on traditional land use 4.5.5
Asimina Skouteri	Chapter 4	86	2547	86		Beale, L. (1997). An inventory of Europe-wide Land use and land cover studies. Report on the CLAUDE workshop on: the user needs for more harmonised land use information at the national and EU level. CLAUDE, Coordinating land use and cover data and analysis in Europe. Concerted Action, European Commission, DG XII, Wageningen, The Netherlands	Has not been added
Asimina Skouteri	Chapter 4	88	2599	88		Brissoulis, H. (2000). Analysis of Land Use Change: Theoretical and Modelling Approaches. Online book: <a href="http://www.wvu.edu/webBook/Brissoulis/contents.htm">http://www.wvu.edu/webBook/Brissoulis/contents.htm</a>	Has not been added
Asimina Skouteri	Chapter 4	91	2732	91		Eetvelde, V.V. and M. Antrop (2004). Analyzing structural and functional changes of traditional landscapes - two examples from Southern France. <i>Landscape and Urban Planning</i> , 67, 79-95	Has not been added
Asimina Skouteri	Chapter 4	97	2965	97		Hoshino, S. (1996). Statistical analysis of land use change and driving forces in the Kansai District, Japan. Working Paper, International Institute for Applied Systems Analysis (IIASA), A-2361 Laxenburg, Austria. pp. 40.	Has not been added
Asimina Skouteri	Chapter 4	101	3097	101		Lausch, A. and Herzog F. (2002). Applicability of landscape metrics for the monitoring of landscape change: issues of scale, resolution and interpretability. <i>Ecological Indicators</i> , 2, 3-15	Has not been added
Asimina Skouteri	Chapter 4	104	3219	104		Nagaiki, T. and T. Kamitani (1999). Agricultural landscapes in Europe and transformation. <i>Landscape and Urban Planning</i> , 18, 289-352	Has not been added
Asimina Skouteri	Chapter 4	104	3235	104		OECD (1998). Environmental Indicators: Towards Sustainable development. Organisation for Economic Co-operation and development, Paris	Has not been added
Asimina Skouteri	Chapter 4	105	3254	105		Palang, H., Mander, U. and A. Luud (1998). Landscape diversity changes in Estonia. <i>Landscape and Urban Planning</i> , 41, 163-169	Has not been added
Asimina Skouteri	Chapter 4	112	3533	112		Turner, M.G. (ed) (1990). Landscape changes in nine rural counties in Georgia. <i>Photogrammetric Engineering and Remote Sensing</i> , 56, 379-386	Has not been added